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RICCARDO GIANNUZZI-SAVELLI, FRANCESCO PUSATERI  
& STEFANO BARTOLINI

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(Gastropoda: Conoidea) 5: loss of planktotrophy  
and pairs of species, with the description of four new species



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Family Cardiidae Lamarck, 1809  
Subfamily Cardiinae Lamarck, 1809  
Genus *Acanthocardia* Gray, 1853  
(type species *Cardium aculeatum* Linné, 1758)

*Cardium indicum* Lamarck, 1819  
(Fig. 1A–D, Fig. 2C)  
  
*Cardium hians* Brocchi, 1814: p. 508, pl. 13, fig. 6 (non Spengler, 1799).  
*Cardium indicum* Lamarck, 1819: p. 4.  
*Cardium (Cardium) indicum* Lamarck – Fischer-Piette, 1977: p. 112, pl. 10, fig. 4 (type).

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BOSS K.J., 1982. Mollusca, in Parker S.P. (ed.), *Synopsis and Classification of Living Organisms*. Vol. 1. McGraw-Hill, New York: 945-1166.  
CARTER J.G., CAMPBELL D.C. & CAMPBELL M.R. 2000. Cladistic perspectives on early bivalve evolution, in Harper E.M., Taylor J.D. & Crame J.A. (eds), *The Evolutionary Biology of the Bivalvia. Geological Society, London, Special Publications*, **177**: 47-95.  
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# A revision of the Mediterranean Raphitomidae (Gastropoda: Conoidea) 5: loss of planktotrophy and pairs of species, with the description of four new species

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## Abstract

In this work, the authors revise 10 pairs of northeastern Atlantic sister cryptic species of the genus *Raphitoma* Bellardi, 1847 as currently conceived. The species within each pair differ only or mostly in their protoconch morphology, which reflects their larval developmental type (multispiral vs. paucispiral, corresponding to planktotrophic vs. non-planktotrophic development, respectively). Of the ten studied pairs, one (*R. histrix*/*R. pseudohystrix*) includes species with almost allochronic ranges; one pair includes species with allopatric ranges (*R. oblonga* NE Atlantic, *R. alleryana* Central Mediterranean Sea); the remaining 8 studied pairs include exclusively Mediterranean species. Four species are described as new: ***R. skylla*** Pusateri & Giannuzzi-Savelli n. sp., ***R. kharybdis*** Pusateri & Giannuzzi-Savelli n. sp., ***R. bartolinorum*** Pusateri & Giannuzzi-Savelli n. sp., ***R. ebreorum*** Pusateri & Giannuzzi-Savelli n. sp. Neotypes are designated for *Raphitoma hystrix* Bellardi (type species of *Raphitoma*), *Pleurotoma laviae* Philippi and *Pleurotoma philberti* Michaud (type species of *Philbertia*); lectotypes are designated for *Clathurella pseudohystrix* Sykes, *C. servaini* Locard, *C. purpurea* var. *denseclathrata* Dautzenberg & Durouchoux, *Philbertia alleryana* Sullioti, *Ph. papillosa* Pallary, *Pleurotoma bicolor* Risso.

## Key words

*Raphitoma*, revision, sister cryptic species, new species.

## Riassunto

Con questo lavoro gli autori fanno la revisione di 10 coppie di specie sorelle del genere *Raphitoma* Bellardi, 1847 come attualmente concepito, presenti nel NE Atlantico.

Le specie di ogni coppia differiscono soltanto, o per lo più, nella morfologia della loro protoconca che riflette il tipo di sviluppo larvale (multispirale/paucispirale, corrispondente rispettivamente a sviluppo larvale planctotrofico o non planctotrofico).

Una delle 10 coppie studiate (*R. histrix*/*R. pseudohystrix*) ha un "range" allocronico, un'altra comprende due specie con "range" allopatrico (*R. oblonga* NE Atlantico, *R. alleryana* Mediterraneo Centrale); le rimanenti 8 comprendono specie esclusivamente mediterranee. Quattro specie sono descritte come nuove: ***R. skylla*** Pusateri & Giannuzzi-Savelli n.sp., ***R. kharybdis*** Pusateri & Giannuzzi-Savelli n. sp., ***R. bartolinorum*** Pusateri & Giannuzzi-Savelli n. sp., ***R. ebreorum*** Pusateri & Giannuzzi-Savelli n. sp. Vengono qui designati i neotipi di *Raphitoma hystrix* Bellardi (specie tipo di *Raphitoma*), di *Pleurotoma laviae* e di *Pleurotoma philberti* Michaud (specie tipo di *Philbertia*); vengono inoltre designati i lectotipi di *Clathurella pseudohystrix* Sykes, *C. servaini* Locard, *C. purpurea* var. *denseclathrata* Dautzenberg & Durouchoux, *Philbertia alleryana* Sullioti, *Ph. papillosa* Pallary, *Pleurotoma bicolor* Risso.

## Parole chiave

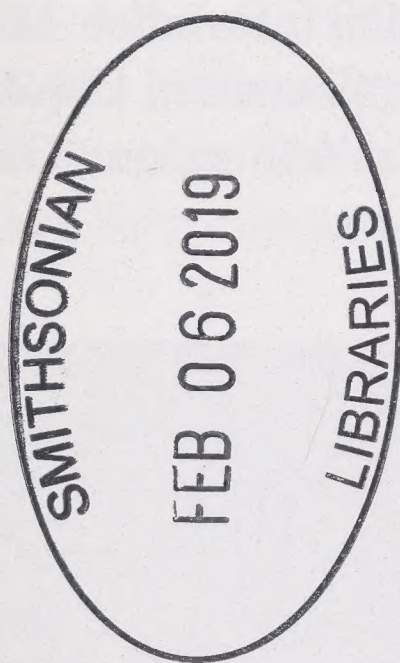
*Raphitoma*, revisione, specie sorelle, nuove specie.

## Introduction

The Raphitomidae are currently considered as a well supported clade of the Conoidea (Bouchet, Kantor, Sysoev & Puillandre 2011), worthy of family ranking. It is probably the most diverse family of Conoidea, in terms of species richness, ecological range and anatomical disparity (Kantor & Taylor 2002), and are therefore considered as potentially ideal candidates for toxin discovery (Fedosov & Puillandre 2014).

We are currently revising the Raphitomidae of the Mediterranean Sea and adjacent Atlantic coasts, of which we provisionally estimated ca. 50 Mediterranean extant species, some of which still undescribed. The taxon Raphitomidae Bellardi, 1875 is based on the genus *Raphitoma* Bellardi, 1847 which was introduced as com-

prising 34 fossil and Recent species (Bellardi 1847: 85), previously classified in various genera (such as *Pleurotoma* and *Clathurella*). During this revision, we have found several pairs of species in the genus *Raphitoma*, differing only or mostly in the size and shape of the protoconch, with one member bearing a multispiral protoconch and the other member with a paucispiral protoconch. The specific distinction is based on the assumption that the dichotomy multispiral protoconch/planktotrophic development vs. paucispiral protoconch/lecithotrophic development (Jablonski & Lutz, 1980) can be used in caenogastropods to recognise distinct sister species (Bouchet, 1989; Oliverio, 1996a, 1996b, 1997); however, it should not be abused to create polyphyletic genera by artificially separating closely related species among different genera only based on





their larval development (Bouchet, 1990). In raphitomids, the separation of *Raphitoma* (multispiral protoconch) and *Philbertia* (paucispiral protoconch) is thus inconsistent and must be rejected.

In a recent paper Manousis et al., 2017 suggested an intriguing hypothesis about a possible poecilogony in Raphitomidae, but unfortunately no evidences were provided.

In the genus *Raphitoma* Bellardi, 1847, we have scored at least teen such pairs of species with different protoconchs (multispiral *vs.* paucispiral: **Tab 1**). Two of the pairs were dealt with in previous works (Pusateri, Giannuzzi-Savelli & Oliverio, 2012, 2013). We present herein a review of the presumed pairs of species, with the taxonomic identification of 20 taxa (of which 4 are described as new) and the discussion of nominal taxa with a still unresolved nomenclatural status.

Material and methods

Our approach was exclusively based on shell morphology due to the almost total lack of anatomical data. Obviously it may not be sufficient to clarify the phylogenetic relationships among the taxa mainly due to the high intraspecific variability. However, some preliminary molecular data seem to suggest the polyphyly of *Raphitoma* (unpublished data, work in progress).

Specimens were studied from materials housed at several European museums, and from about 100 private collections (see abbreviations). Unless otherwise stated, the shells originated after sorting bioclastic sand samples collected between 0-40 m depth.

SEM images were taken by Andrea Di Giulio at the “LIME” (Interdepartmental Laboratory of Electron Microscopy – Roma Tre University) and by Marco Oliverio (LAB SEM Sapienza University, Roma). Light photographs were taken (if not otherwise stated) by Stefano Bartolini using a Canon EOS 400D digital photcamera, with standard objective 50 mm + adapted objectives (25 and 12.5 mm) for 16 and 8 mm vintage cine camera and

by Riccardo Giannuzzi Savelli using a Canon EOS 45D mounted on a Kyowa binocular microscope, assembled with Helicon Focus 6 software and background removed with Clipping Magic.

Abbreviations

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CGS: Can Geyran Seashells Center, Istanbul (Turkey); HUJ: Hebrew University of Jerusalem (Israel); IRSNB: Institut Royal des Sciences Naturelles de Belgique, Bruxelles (Belgium); MCSNM: Museo Civico Storia Naturale, Milano (Italy); MCZR: Museo Civico di Zoologia, Roma (Italy); MCSNG: Museo Civico Storia Naturale Genova; MDCL: Musée des Confluences, Lyon (France); MHNG: Muséum d’histoire naturelle, Geneve (Switzerland); MNB: Museum fur Naturkunde, Berlin (Germany); MNHN: Musée Nationale Histoire Naturelle, Paris; MNHNC: Museo Nacional de Historia Natural, Santiago (Chile); MPRC: Museo Paleomarino Reggio Calabria (Italy); MRSN: Museo Regionale Storia Naturale, Torino (Italy); MRSNT: Museo Regionale Storia Naturale, Terrasini (Italy); NHMUK: Natural History Museum United Kingdom; NMW: National Museum of Wales (United Kigdom); SMF: Senckenberg Museum, Frankfurt/M (Germany); SMNH: Swedish Museum of Natural History, Stockholm (Sweden); USNM: United States Natural Museum, Washington D.C. (USA).

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multispiral protoconch		paucispiral protoconch	
<i>R. histrix</i> Bellardi, 1847	pag. 6	<i>R. pseudohystrix</i> Sykes, 1906	pag. 11
<i>R. oblonga</i> (Jeffreys, 1867)	pag. 15	<i>R. alleryana</i> (Sullioti, 1889)	pag. 20
<i>R. bicolor</i> (Risso, 1826)	pag. 22	<i>R. farolita</i> Nordsieck, 1977	pag. 26
<i>R. skylla</i> n. sp.	pag. 29	<i>R. kharybdis</i> n. sp.	pag. 30
<i>R. laviae</i> Philippi, 1836	pag. 32	<i>R. bartolinorum</i> n. sp.	pag. 36
<i>R. locardi</i> Pusateri & Giannuzzi-Savelli, 2013	pag. 39	<i>R. philberti</i> (Michaud, 1829)	pag. 43
<i>R. ebreorum</i> n. sp.	pag. 48	<i>R. papillosa</i> (Pallary, 1904)	pag. 50
<i>R. contigua</i> Monterosato, 1884	pag. 52	<i>R. spadiana</i> Pusateri & Giannuzzi-Savelli, 2012	pag. 56
<i>R. lineolata</i> (B.D.D., 1883)	pag. 58	<i>R. smriglioi</i> Pusateri & Giannuzzi-Savelli, 2013	pag. 61
<i>R. brunneofasciata</i> Pusateri & Giannuzzi-Savelli, 2013	pag. 64	<i>R. syrtenensis</i> Nordsieck, 1977	pag. 66

Table 1. List of pairs of sibling species of the genus *Raphitoma* here treated.

Tab. 1. Elenco delle coppie di specie sorelle del genere *Raphitoma* qui trattate.



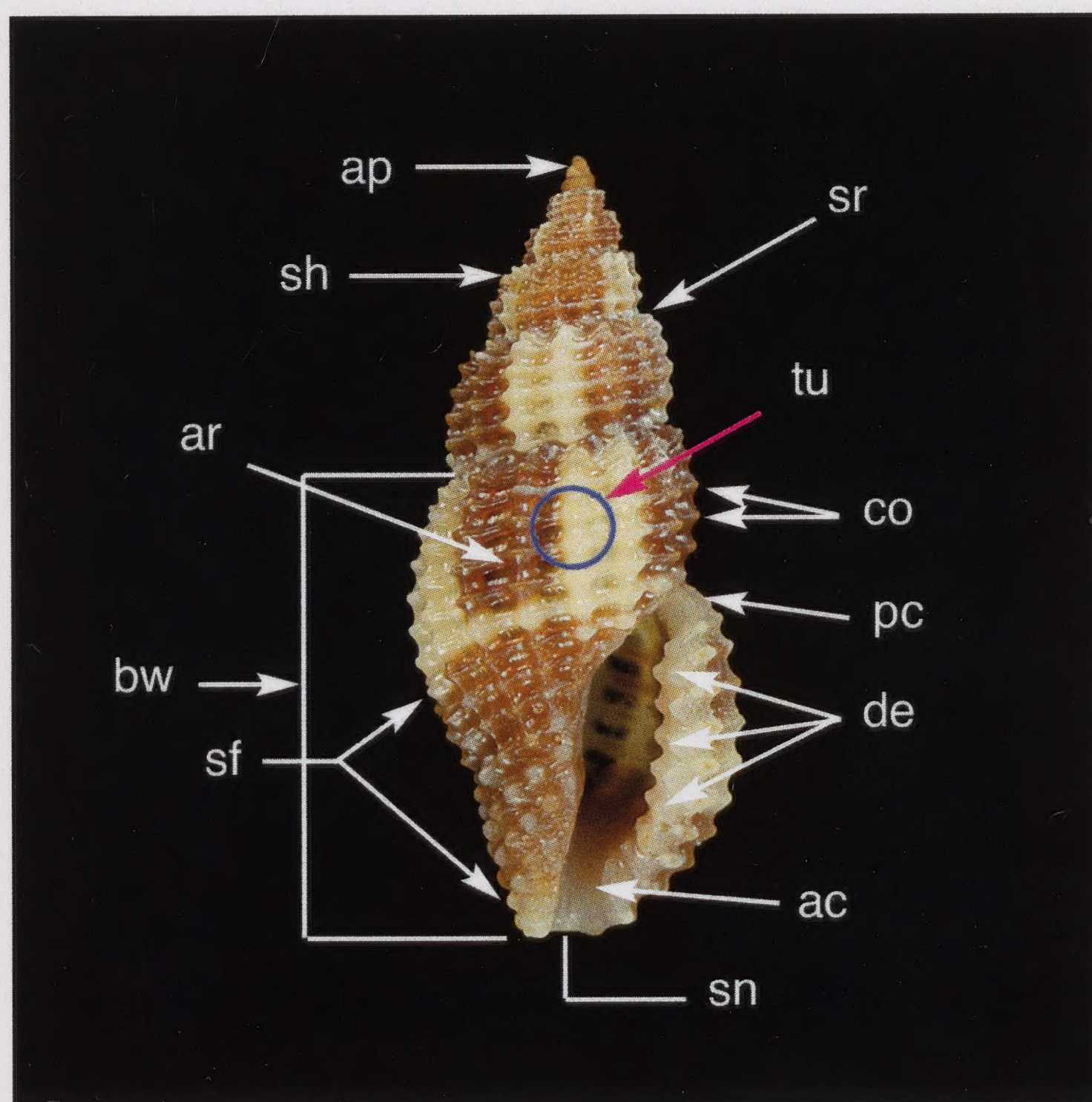
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no; VAZ: Angelo Vazzana; VIL: Alberto Villari.  
sh: empty shells; WI: wrong identification; DR: doubtful record; H: height; W: width; DS: standard deviation.

The following diagnostic characters have been employed in the description of the species (Fig. 1 and 2):  
Protoconch: The number of protoconch whorls (Fig. 3) have been counted according to the method of Verduin,

1976: 25. The maximum diameter is measured from the top view according to Gofas & Oliver (2010: 27).  
The color of protoconchs varies from white to dark brown (Fig. 4).

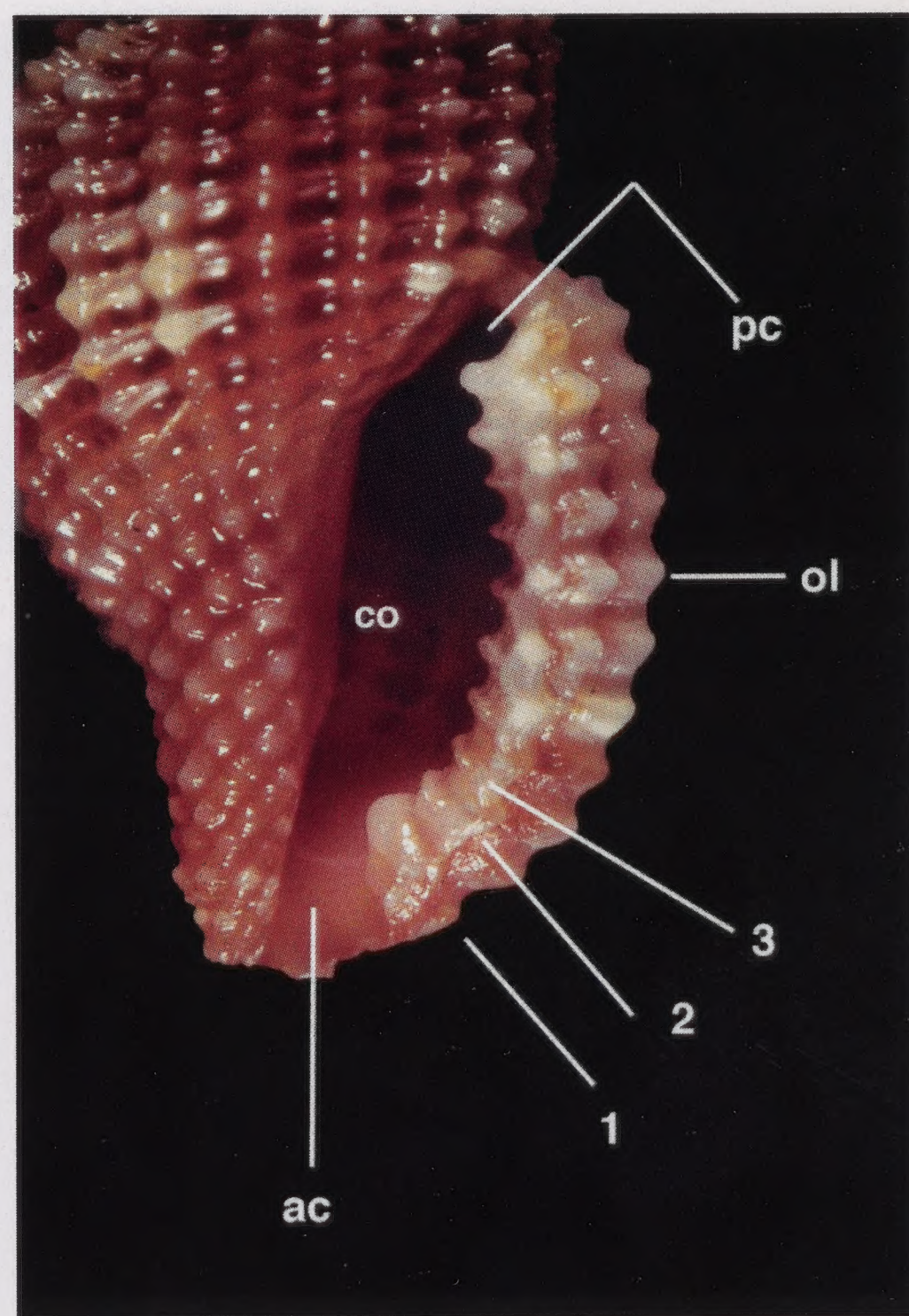
Teleoconch: Outline of the whorls (ovato-pupoid, sub-pupoid, sub-fusiform, slender fusiform, turreted, biconic, cyrto-pupoid) (Fig. 5); aspect (robust, solid, thin, fragile) (Fig. 6); sculpture strong (Fig. 6A) or not strong (Fig. 6B), inclination of axial ribs (prosocline, orthocline, opisthocline) (Fig. 7) and type of cancellation (rectangular, subquadrangular, squared) (Fig. 8); tubercles at the intersections (small, large, elongated, spinulose, pearl shaped) (Fig. 9); presence/absence of microscopic granulation over part or whole surface (Fig. 10); subsutural zone that can be a weak shoulder, or a more or less steep, narrow to wide subsutural ramp; strength of growth marks corresponding to past posterior sinus on the subsutural ramp (Fig. 11); when the peristome is complete the outer lip can be simple or thickened and toothed; with barely visible weak folds to strong denticles (sometime bifid if secondary cordlets are present) on inner side of the lip (Fig. 12); siphonal fasciole indistinct or well marked with strong nodular cordlets (Fig. 13); length and width of siphonal canal (which may be variable within a species) (Fig. 14).

Measurements: taking into consideration the height ranges observed in full adults of northeastern Atlantic Raphitominae (unpublished results) we conventionally define the size classes as small (<10 mm), medium (10-20 mm), large (>20 mm) for the genus. The measures were taken with a digital caliper (for shells over 10 mm)



**Fig. 1.** Teleoconch characters: ac, anterior channel; ap, apex; ar, axial ribs; bw, body whorl or last whorl; co, spiral cordlets; de, denticles; pc, posterior channel; sf, siphonal fasciole; sh, shoulder; sn, siphonal notch; sr, subsutural ramp; tu, tubercles.

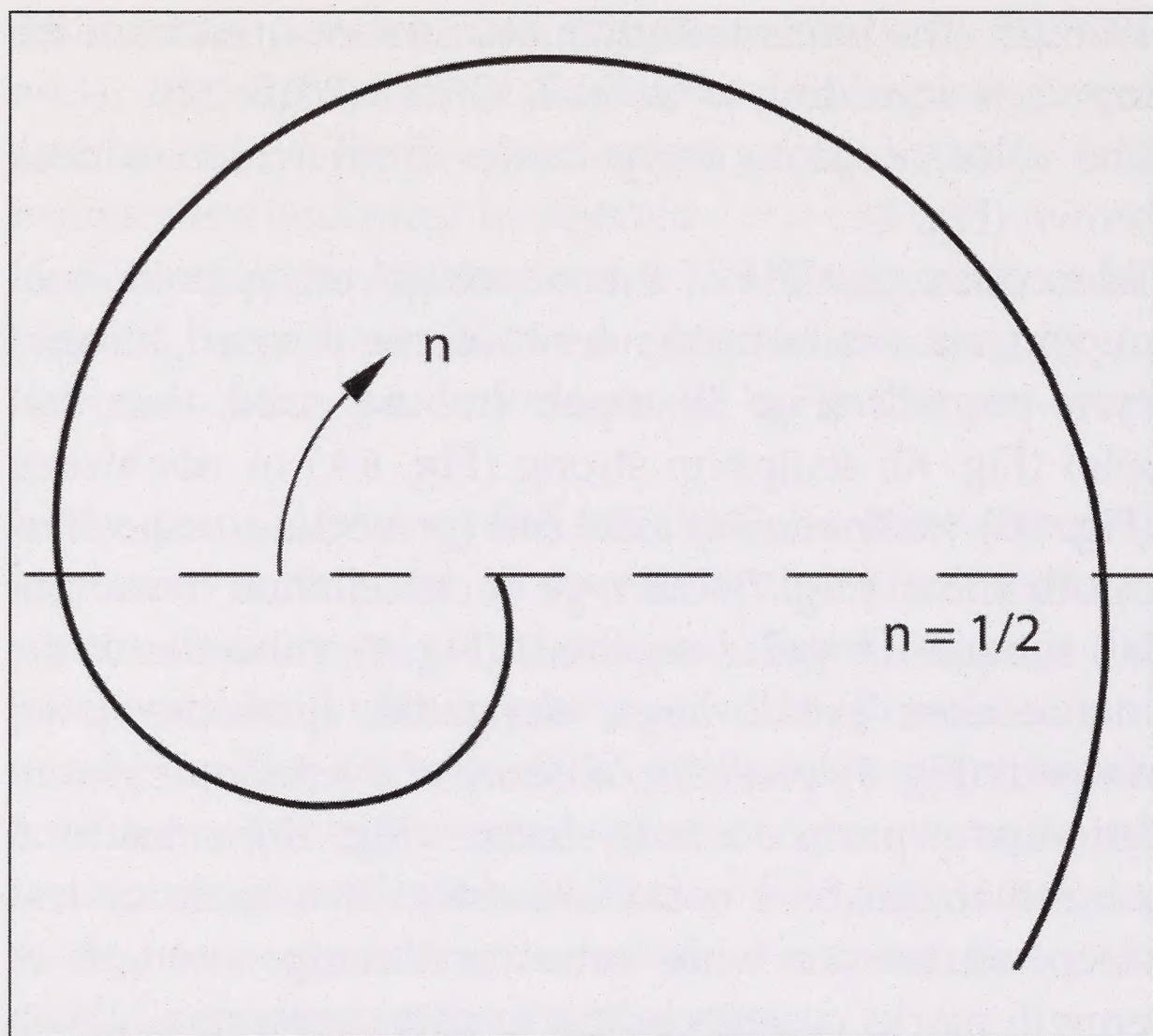
**Fig. 1.** Caratteri della teleoconca: ac, canale anteriore; ap, apice; ar, coste assiali; bw, ultimo giro; co, cordoni spirali; de, denti; pc, canale posteriore; sf, fasciolo sifonale; sh, spalla; sn, intacco sifonale; sr, rampa sottosuturale; tu, tubercoli.



**Fig. 2.** Apertural features: ac, anterior canal; co, columella; ol, outer lip; 1, 2, 3, denticles numeration; pc, posterior canal.

**Fig. 2.** Caratteri dell'apertur: ac, canale anteriore o sifonale; co, columella; ol, labbro esterno; 1, 2, 3, numerazione dei denti; pc, canale posteriore o anale.





**Fig. 3.** Counting of protoconch whorls according the method of Verduin (1977).

**Fig. 3.** Metodo di Verduin (1977) per la conta del numero dei giri della protoconca.

or with a calibrated eyepiece micrometer mounted on a Kyowa microscope (for shells under 10 mm). We measured: height, width, height of last whorl, height of aperture.

Counting: axial ribs were counted on the last whorl anti-clockwise starting from outer lip (Fig. 15). Since on the last whorl spiral cordlets can be coalescing with nodule series of siphonal fasciole we have referred only to cordlets of the penultimate whorl (above the aperture).

## Systematics

(Citation of unpublished names is not intended for taxonomic purposes)

Family Raphitomidae Bellardi, 1875

Genus *Raphitoma* Bellardi, 1847

Type species: *Pleurotoma hystrix* Cristofori and Jan, 1832 (*nomen nudum*, validated by Bellardi, 1847 as "*Pleurotoma hystrix* Jan.") by subsequent designation (Monterosato, 1872: 54).

## Synonyms

*Cirillia* Monterosato, 1884, non Rondani, 1856 – type species: *Murex linearis* Montagu, 1803, by subsequent designation (Crosse, 1885).

*Cordieria* Monterosato, 1884 non Roualt, 1848 – type species: *Murex reticulatus* Brocchi, 1814, by subsequent designation (Crosse, 1885).

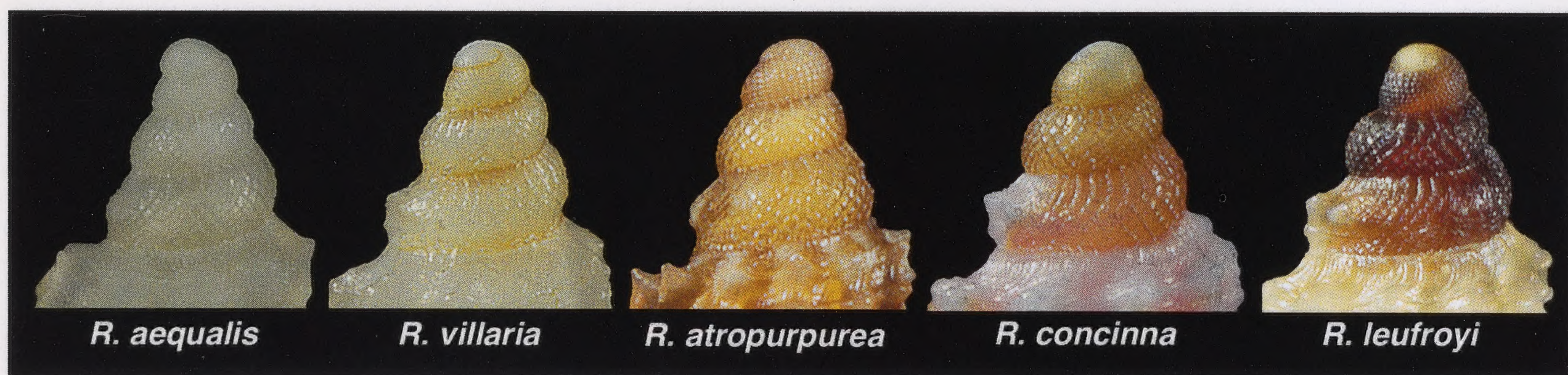
*Leufroyia* Monterosato, 1884 – Type species: *Pleurotoma leufroyi* Michaud, 1827, by subsequent designation (Crosse, 1885)

*Philbertia* Monterosato, 1884 – type species: *Pleurotoma philberti* Michaud, 1829, by subsequent designation (Crosse, 1885)

*Cenodagreutes* E.H. Smith, 1967 – type species: *Cenodagreutes aethus* E. H. Smith, 1967 [= *Raphitoma aequalis* (Jeffreys, 1867)], by original designation.

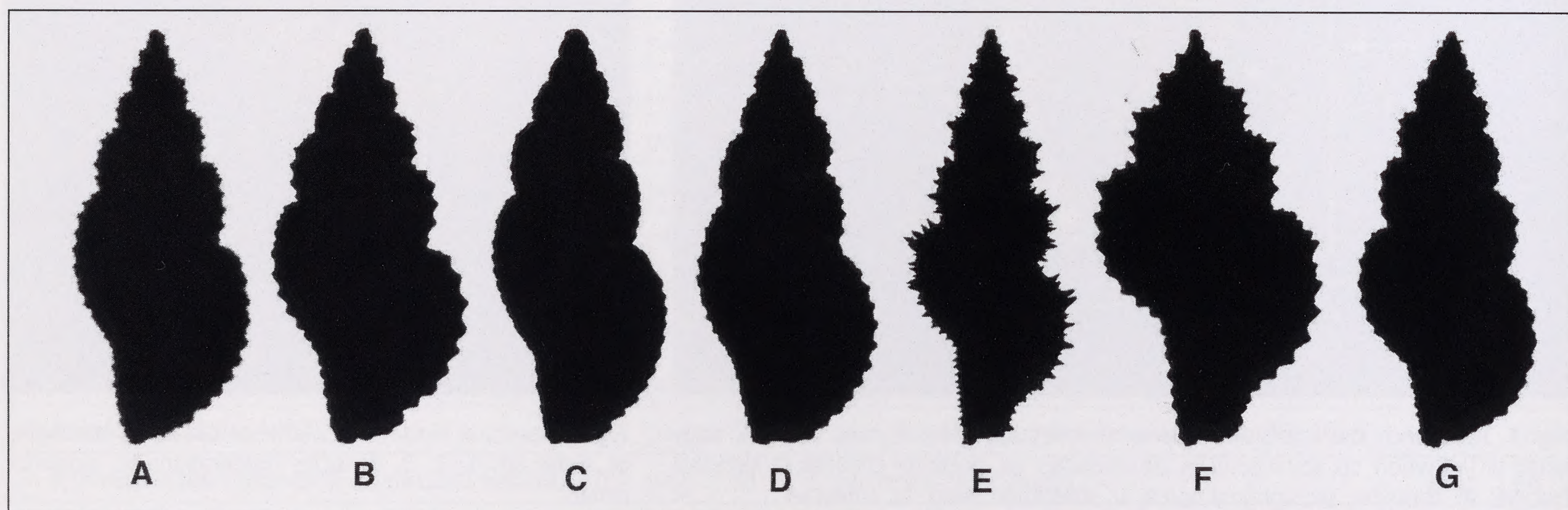
*Cyrtoides* Nordsieck, 1968 – type species: *Pleurotoma rudis* Scacchi, 1836, by original designation.

*Lineotoma* Nordsieck, 1977 – nomen novum pro *Cirillia* Monterosato, 1884, non Rondani, 1856.



**Fig. 4.** Variability in the protoconch color.

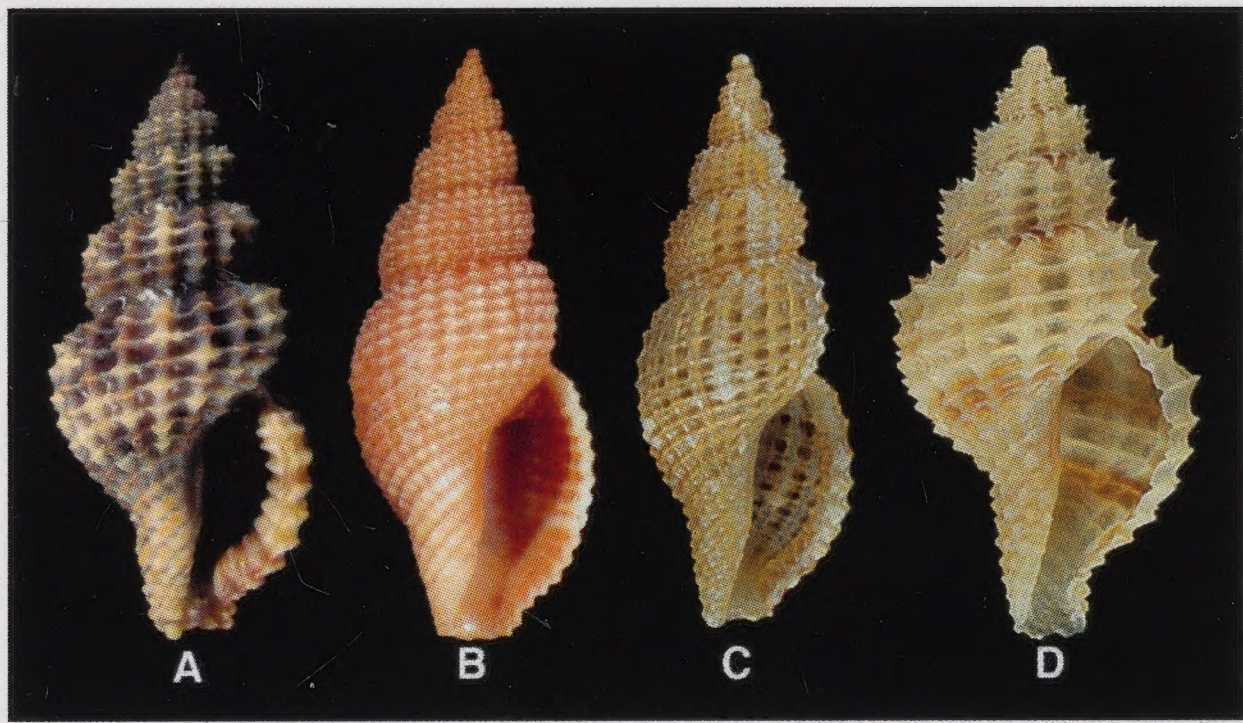
**Fig. 4.** Variabilità del colore della protoconca.



**Fig. 5.** Outline: A. ovato-pupoid; B. subpupoid; C. fusiform; D. subfusiform; E. turreted; F. biconic; G. cyrtopupoid.

**Fig. 5.** Profilo: A. ovato-pupoide; B. subpupoide; C. fusiforme; D. subfusiforme; E. turricolato; F. biconico; G. cirtopupoide.





**Fig. 6.** Aspect: **A.** robust; **B.** solid; **C.** thin; **D.** fragile.  
**Fig. 6.** Aspetto: **A.** robusto; **B.** solido; **C.** sottile; **D.** fragile.

### Diagnosis

Shell of small to medium size for the family, from 5 mm (*R. laviae*) to 25 mm (*R. cordieri*, *R. bourguignati*), from turreted to sub-pupoid. Protoconch of 3-4.5 whorls when multispiral, with protoconch I (embryonic shell) of 0.5-0.7 whorls, with a reticulate sculpture of spirals and orthocline axial striae, and protoconch II (larval shell) of 2.3-3.5 whorls, with a diagonally cancellate sculpture and a frequently keeled last whorl; paucispiral protoconch of 2 whorls, with large nucleus and reticulate sculpture. Teleoconch with slender spire of 5 (*R. brunneofasciata*) to 9 (*R. cordieri*) uniformly convex whorls, with reticulate-cancellate sculpture, axials broader than spirals. Outer lip with 7-13 inner denticles. Columella simple, slightly sinuous anteriorly. Siphonal canal from very short (*R. contigua*) to moderately long (*R. cordieri*). Siphonal notch wide, plain or intort.

### Remarks

For the complex nomenclatural issues, including the type species designations, see Dall (1918: 316), Van Aartsen, Menkhorst & Gittenberger (1984: 89-90) and Rolán, Otero-Schmitt & Fernandes (1998: 105) and see here below under *R. histrix* (Bellardi, 1847).

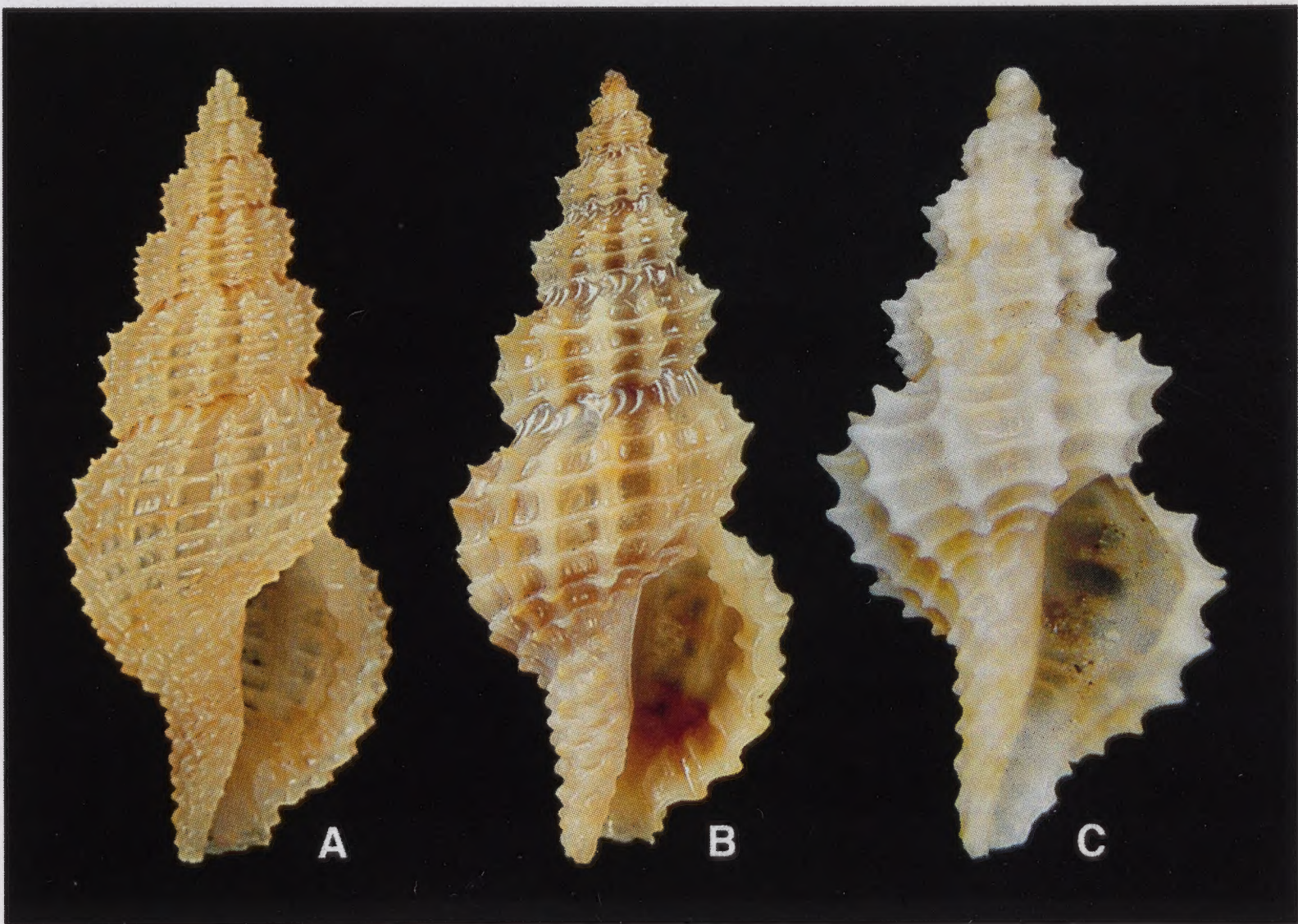
Protoconchs are rather homogeneous even across species, with slight differences in the number of whorls, size (width and height), quality of markings and colour of the embryonic shell (in the multispiral protoconchs) that can be white (*R. linearis*), light straw (*R. villaria*), orange brown (*R. bicolor*), red brown (*R. concinna*) or violet (*R. leufroyi*) (Fig. 4), presence/absence of a keel on the last protoconch whorl.

With few exceptions, living specimens are very seldom collected, which made information on the anatomy of *Raphitoma* scanty and scattered. As is known for Raphitomidae in general, there is great variation in the foregut anatomy (Kantor & Taylor, 2002), some species having neither radula nor venom gland (as *R. villaria* and *R. linearis*), while others (e.g.: *R. purpurea* and *R. leufroyi*) do have them (Sheridan, Van Mol & Bouillon, 1973: 177; Pusateri & Giannuzzi-Savelli, 2008: 124). The actual phylogenetic value of this variability is still unknown, and probably low, whilst at species level these characters may prove diagnostic. The structure of the proboscis of *R. purpurea* was described by Miller (1989: 173) and by Sheridan, Van Mol & Bouillon (1973: 177). In *R. linearis* and *R. leufroyi* there is also a rhynchodeal introvert or pseudoproboscis (Taylor, Kantor & Sysøev, 1993: 128) called “pseudotrompe” by Sheridan, Van Mol & Bouillon (1973: 178).

Eggs and larvae of *R. purpurea* and *R. linearis* were described by Lebour, 1934. According to Lebour (1934: 543) the velum of the veliger of *R. purpurea*, *R. linearis*, and *R. leufroyi* is colourless and at first bilobed, then the larva may grow at large size (up to 4 mm in *R. linearis*) and has four lobes. Larvae have a small, round and thin operculum that is lost immediately after metamorphosis.

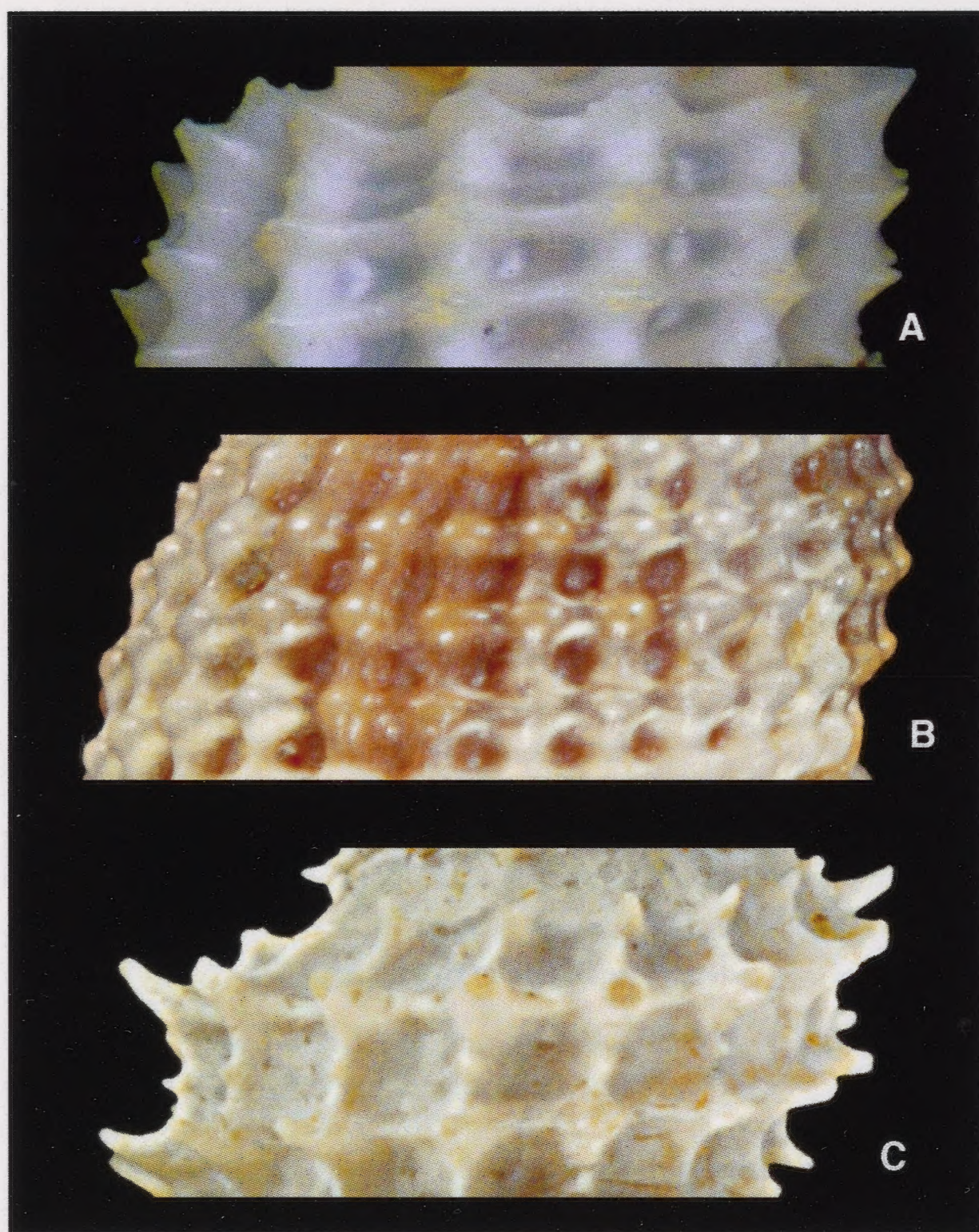
### Ecology

In the Mediterranean Sea, species of *Raphitoma* are usually active at night time, and live mostly on soft bottoms, 0-100 m depth, ranging from coastal bioclastic coarse sands to muddy bioclastic coarse sands, but also



**Fig. 7.** Inclination of axial ribs: **A.** prosocline; **B.** orthocline; **C.** opisthocline.  
**Fig. 7.** Inclinazione delle coste: **A.** prosocline; **B.** ortocline; **C.** opisthocline.





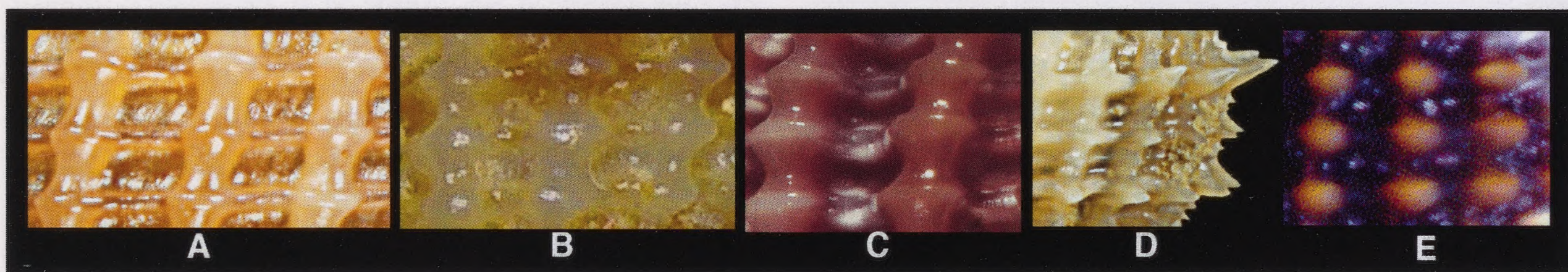
**Fig. 8.** Cancellation: **A.** rectangular; **B.** subquadrate; **C.** squared. Sometimes white chevron marks can appear inside (**A**).

**Fig. 8.** Cancellatura: **A.** rettangolare; **B.** subquadrata; **C.** quadrata. Talvolta all'interno, si possono notare alcune freccette bianche (**A**).

in sandy pockets amidst rocks or phanerogams meadows, although it is not infrequent to find specimens hiding under stones and in crevices, especially at daytime. One species (*R. pseudohystrix*) has been found in bottoms down to 700 m depth.

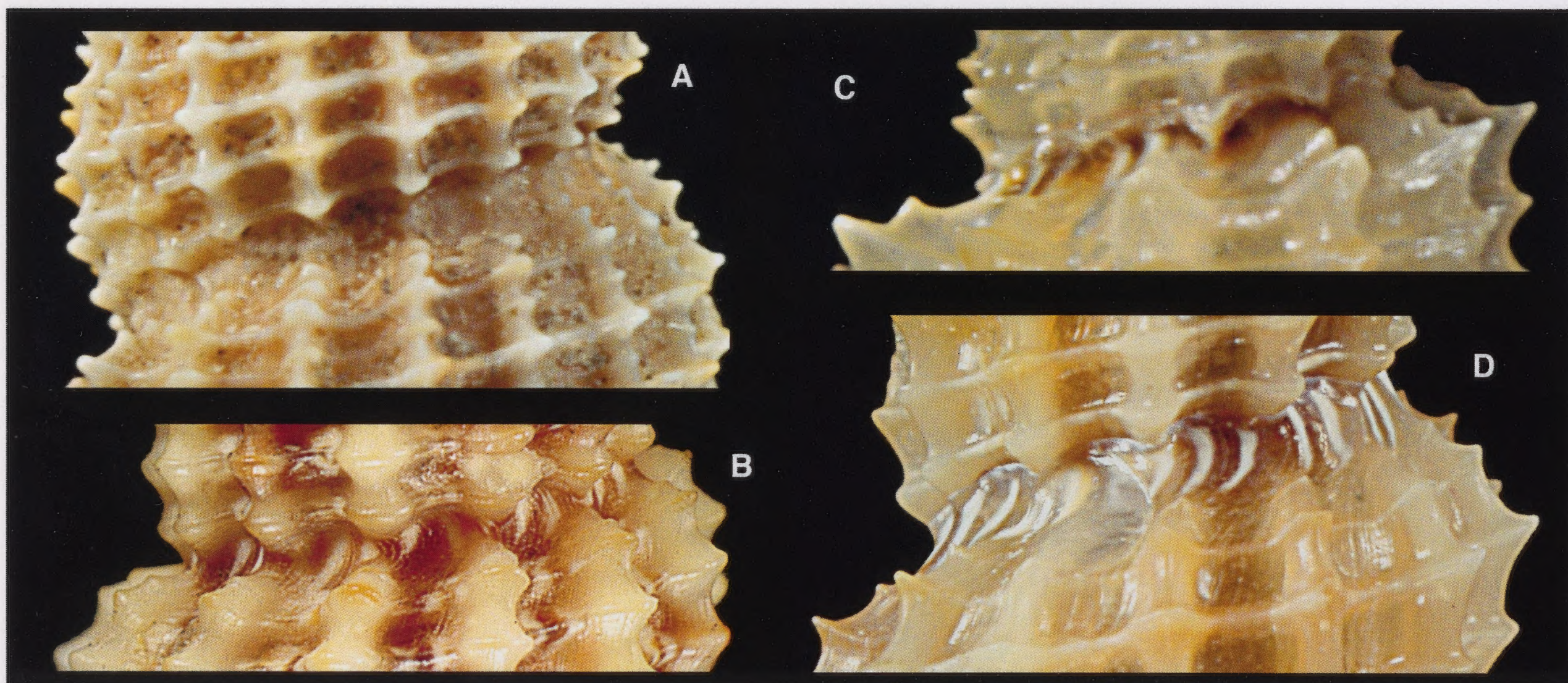
***Raphitoma hystrix* Bellardi, 1847**  
(Figs 17-18A, 21A)

- Raphitoma hystrix* Bellardi, 1847: 85 tav. IV fig. 14  
*Pleurotoma hystrix* De Cristofori & Jan, 1832 (*nomen nudum*)  
*Raphitoma hystrix* Sismonda, 1847: 35  
*Pleurotoma hystrix* D'Orbigny, 1852: 152  
*Daphnella (Raphitoma) hystrix* Chenu, 1859: 149 fig, 672  
*Pleurotoma hystrix* Brugnone, 1862: 28 (*pars*)  
*Pleurotoma spinosus* [sic!] Conti, 1864: 33 n. 34 e p. 52 non Lamarck, 1822 nec Defrance, 1826 nec J. de C. Sowerby, 1835, nec Grateloup, 1847  
*Pleurotoma spinosa* [Conti] Mantovani, 1868: 64  
*Mangelia hystrix* Foresti, 1868: 15  
*Defrancia hystrix* Tiberi, 1869: 261 (*pars*)  
*Pleurotoma hystrix* Coppi, 1869: 31  
*Defrancia hystrix* [sic!] Weinkauff, 1870: 86 (*pars*)  
*Defrancia hystrix* Bell, 1871: 356  
*Pleurotoma spinulosus* [sic!] Conti, 1871: 39 (misspelling pro *spinosus*)  
*Echion hystrix* Monterosato, 1872a: 72  
*Pleurotoma hystrix* Wood, 1872: 41 pl. 6 figs 3a,b  
*Raphitoma hystrix* Cocconi, 1873: 63



**Fig. 9.** Types of tubercles; **A.** small; **B.** large; **C.** elongated; **D.** spinulose; **E.** pearl-shaped.

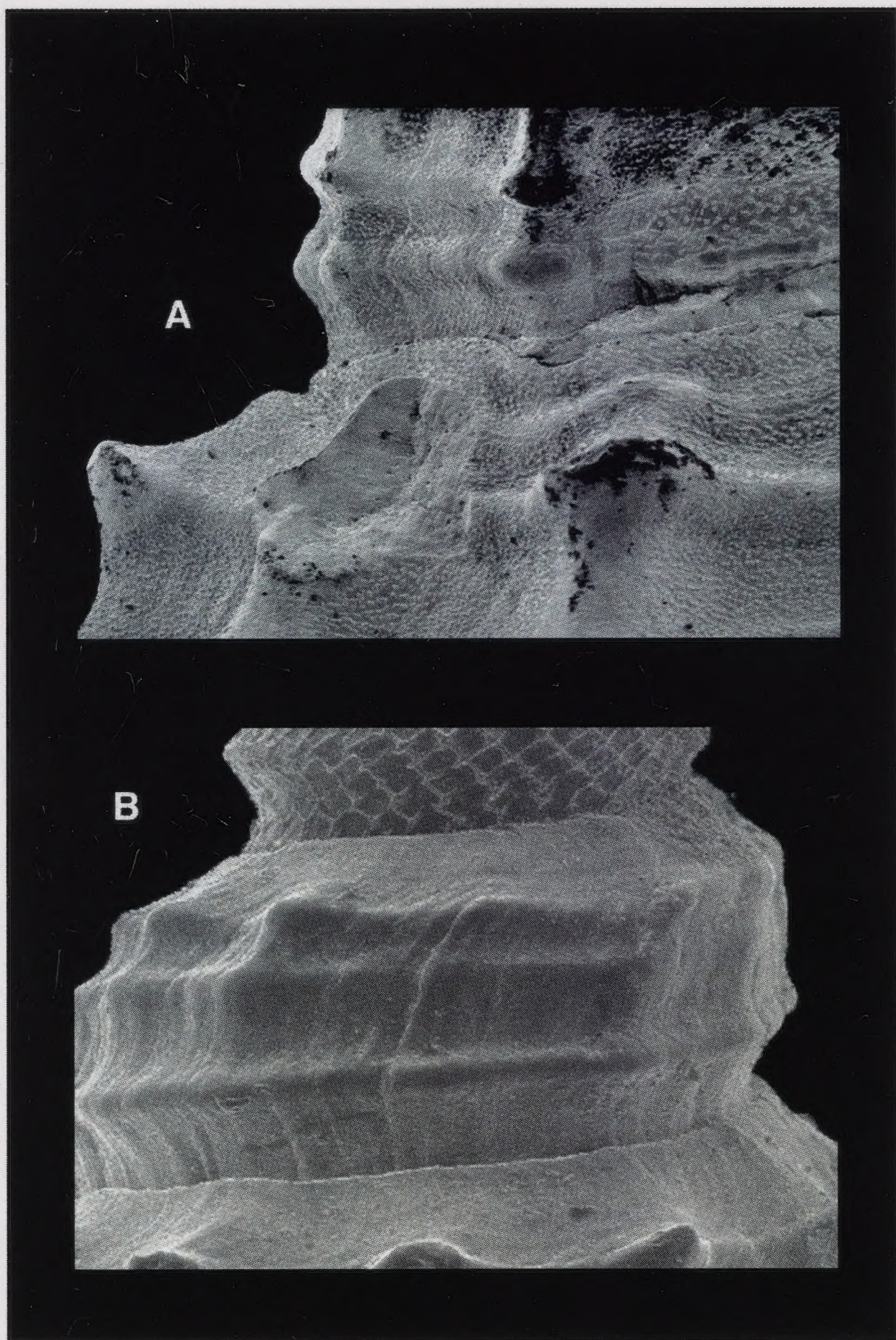
**Fig. 9.** Tipi di tubercoli; **A.** piccoli; **B.** larghi; **C.** elongati; **D.** spinosi; **E.** a perline.



**Fig. 10.** Subsutural ramp: **A.** weak shoulder; **B.** plain and narrow; **C.** plain and wide; **D.** inclined and wide. Sometimes, white comma-like marks can appear on the ramp (**D**).

**Fig. 10.** Rampa sottosuturale: **A.** brevissima; **B.** piana e stretta; **C.** piana e larga; **D.** larga ed inclinata. Talvolta si possono notare alcune virgolette di colore bianco (**D**).





**Fig. 11.** Surface aspect: **A.** surface finely microgranulated; **B.** surface smooth.

**Fig. 11.** Aspetto della superficie: **A.** con microgranuli; **B.** liscia.

*Defrancia hystrix* De Cristof. & Jan, Seguenza, 1873: 298 n. 128

*Defrancia hystrix* De Cristof. & Jan, Seguenza, 1875: 208

*Homotoma histrix* Bellardi, 1877: 266

*Pleurotoma (Defrancia) hystrix* Monterosato, 1877b: 38

*Pleurotoma (Defrancia) histrix* Brugnone, 1877: 36

*Pleurotoma hystrix* Dewalque, 1880: 478

*Homotoma histrix* Zuccari, 1882: 16

*Homotoma histrix* Sacco, 1890: 281 n. 4279

*Clathurella hystrix* Carus, 1893: 424 (*pars*)

*Homotoma histrix* Meli, 1896a: 142

*Homotoma histrix* Meli, 1896b: 89

*Raphitoma (Homotoma) hystrix* Ivolas & Peyrot, 1900: 119

*Peratotoma histrix* Sacco, 1904: 53, tav. 13 fig. 37

*Peratotoma histrix* Cerulli-Irelli, 1910: 56, tav. 5 fig. 22-24

*Pleurotoma hystrix* Tesch, 1912: 90 n. 232

*Clathurella hystrix* Harmer, 1915: 240 fig. 24

*Perotoma* [sic!] *histrix* Zuffardi & Comerci, 1929

*Peratotoma histrix* Socin, 1941: 10

*Raphitoma histrix* Wenz, 1943: 1452, fig. 4108

*Raphitoma hystrix* Beets, 1946: 107

*Raphitoma histrix* Glibert, 1960a: 17, pl. 4, fig. 18

*Raphitoma hystrix* Menesini & Ughi, 1983: 237

*Raphitoma histrix* Chirli, 1997: 81, tav. 23, figs 5-7

*Raphitoma hystrix* Rolan et al., 1998: 105, fig. 19, 20

*Raphitoma histrix* Ceregato, Raffi & Scarponi, 2007

## Type material

*Raphitoma histrix* Bellardi - Neotype, MRSN Torino 011.16.008, (17.6 x 5.9 mm), "Colli Astesi" (Pliocene - Piacenzian) (here designated).

## Type locality

Colli Astesi (Pliocene, Piacenzian).

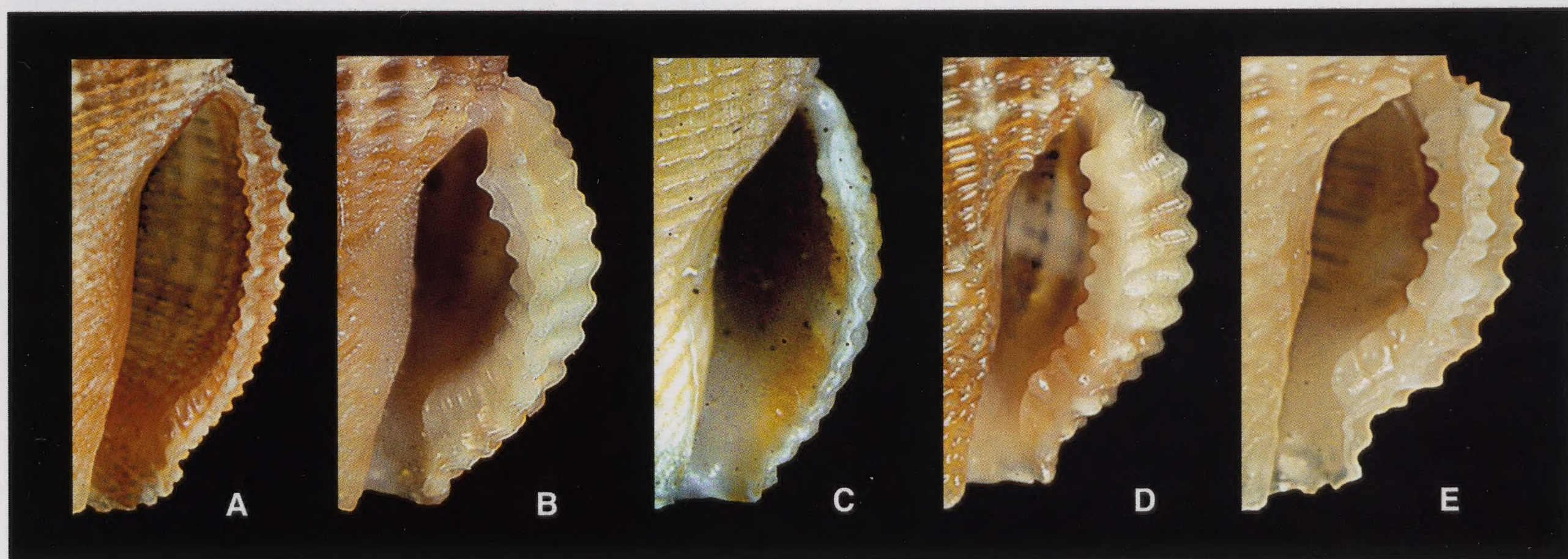
## Material examined

The type material and:

Italy: Colli Astesi (Pliocene, Piacenzian), 2 sh with Sacco's label reading "Peratotoma histrix/(Jan)/Colli Astesi/4600"; Asti, 1 sh with anonymous handwritten label reading "Pleurotoma histrix Jan/Astigiana"; Zinola (Pliocene) 1 fragment labelled "Peratotoma histrix/(Jan)/Zinola Savona/9756"; 1 fragment labelled Masserano, figured by Sacco (1904: pl. 13 fig. 37). All specimens in the Bellardi-Sacco coll. (MRSN n. cat. 011.16.008).

## Description [in square brackets the data of the neotype]

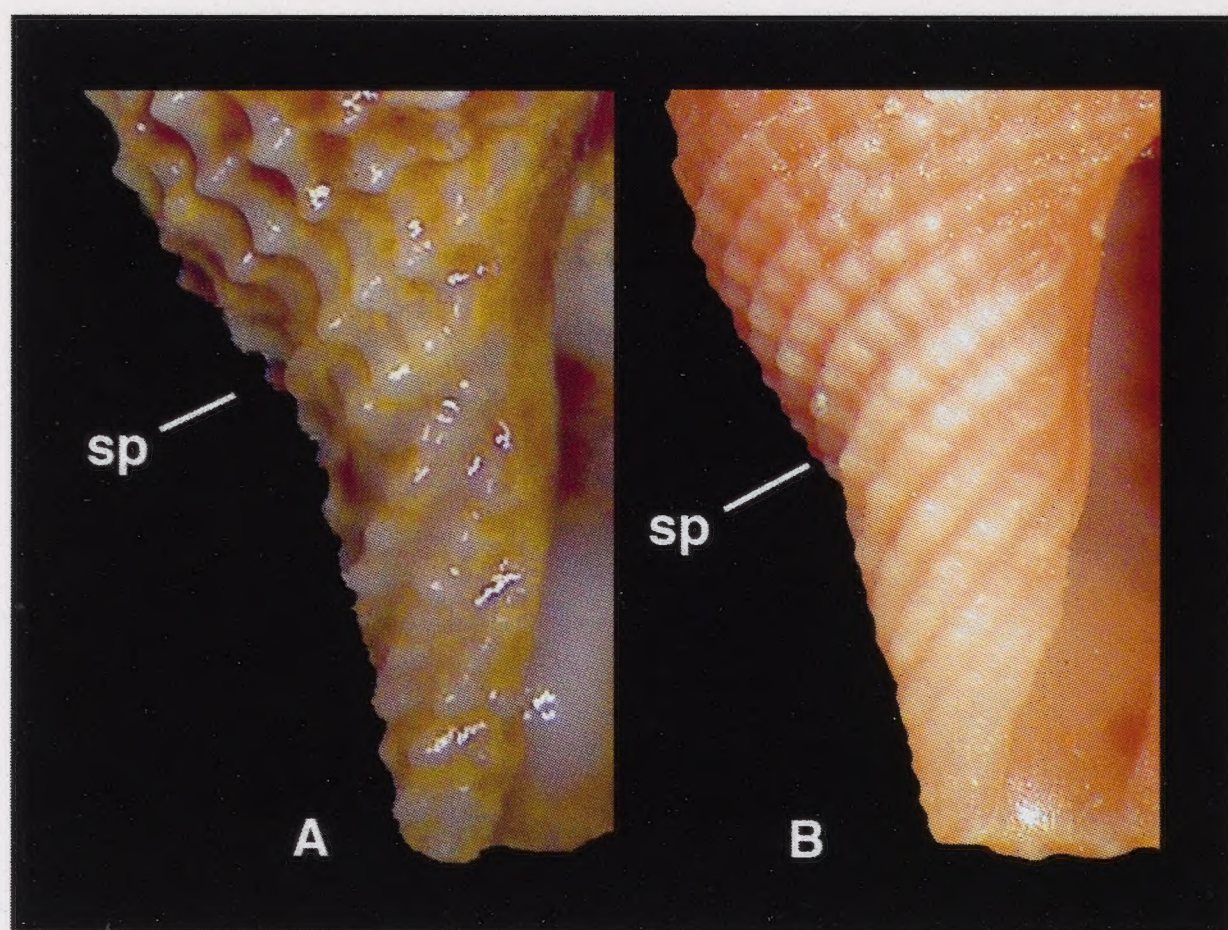
Shell of medium size for the genus (Figs 1-5; 27A-E), height: 9-20 mm, mean: 14.02, DS: 1.88 [17.6], width:



**Fig. 12.** Aspect of outer lip: **A.** thin; **B.** thick; denticles: **C.** scarcely visible and lyrate; **D.** strong; **E.** strong. some denticles bifid.

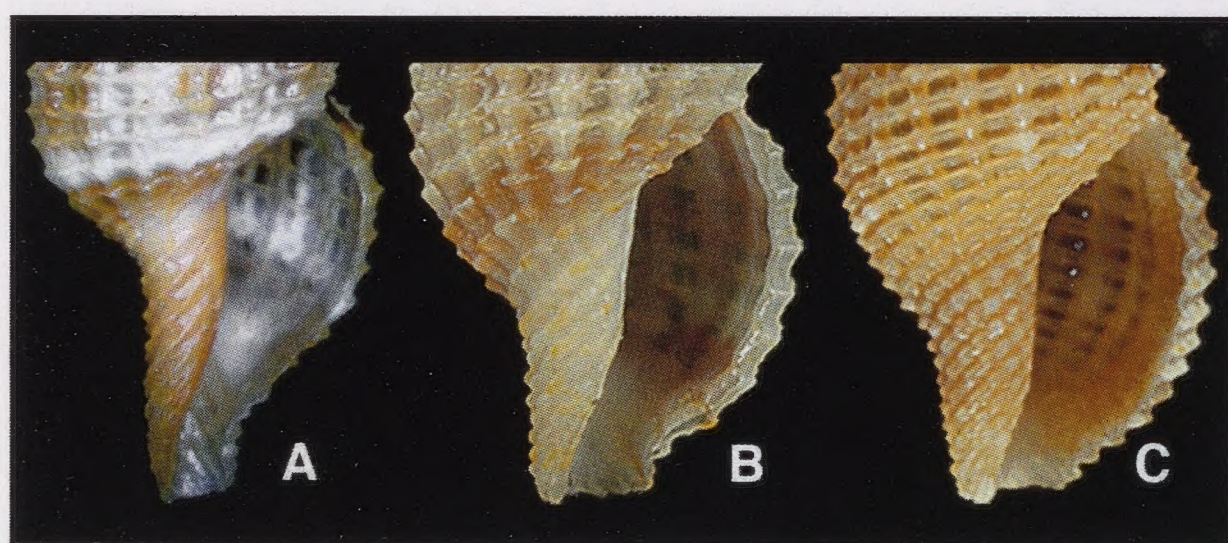
**Fig. 12,** Aspetto del labbro esterno: **A.** sottile; **B.** spesso; denti: **C.** poco evidenti e lirati; **D.** forti; **E.** forti con alcuni doppi.





**Fig. 13.** Siphonal fasciole: **A.** well marked; **B.** indistinct; sp, starting point of siphonal fasciole.

**Fig. 13.** Fasciolo sifonale: **A.** ben evidente; **B.** indistinto; sp, punto di partenza del fasciolo sifonale.



**Fig. 14.** Siphonal canal: **A.** long; **B.** medium length; **C.** short.

**Fig. 14.** Canale sifonale: **A.** lungo; **B.** di media lunghezza; **C.** breve.

3.5-6 mm, mean: 5, DS: 0.55 [5.9]. Fragile, fusiform, slender H/W: 2.80-3.00, mean: 2.92, DS: 0.13 [2.98].

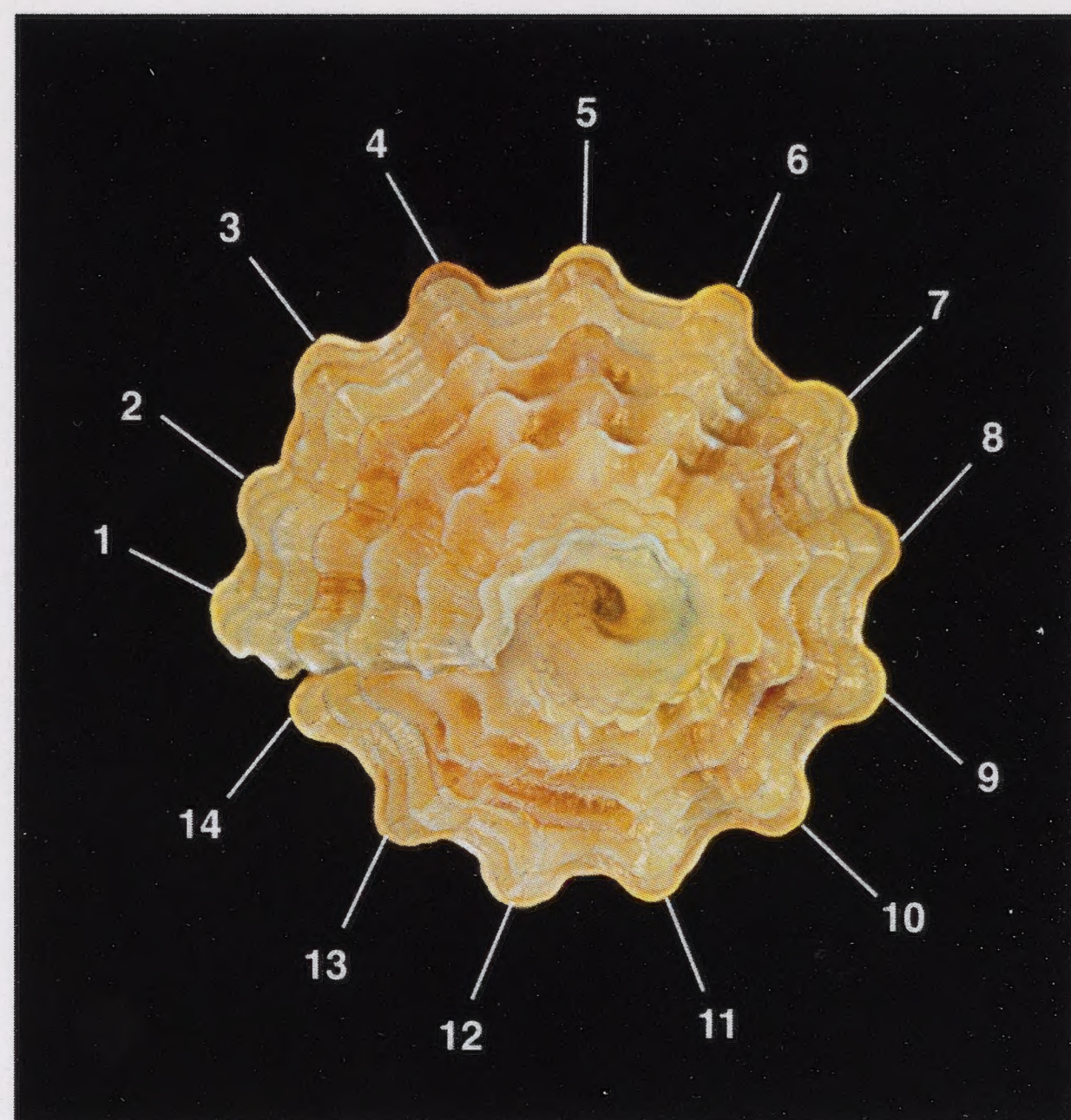
**Protoconch multispiral** (Figs 18A-21A) of 3.2 convex whorls, height: 691  $\mu$ m, width: 498  $\mu$ m: protoconch I of 1.1 whorls, width: 196  $\mu$ m, covered by thin cancellations, protoconch II with a diagonally cancellate sculpture starting after a wide subsutural zone with fine axial threads. Last whorl with a moderate keel before the onset of the teleoconch. **Protoconch-teleoconch boundary** well marked, slightly flexuose, opisthocline.

**Teleoconch** of 6-7 [7] convex and stepped whorls, weak suture and strong sculpture. No microgranules on the surface. **Axial sculpture** of 22-24 orthocline or slightly opisthocline ribs (occasionally more in larger specimens), and interspaces wider ( $\times 4$ ) than the ribs. Ribs, on the last whorl, ending at the beginning of well defined siphonal fasciole.

**Spiral sculpture** of primary cords stronger than axials, and (starting on the fourth whorl) secondary cordlets. Three primary cords and three secondary cordlets above the aperture. Cancellation squared, with spinulose processes of medium size at the intersection. Outer sculpture visible throughout the internal shell wall.

**Subsutural ramp** wide, smooth, slightly concave, delimited by low spinose first spiral cord.

**Columella** simple, slightly sinuous anteriorly. Siphonal canal long and sinuose.



**Fig. 15.** Counting of axial ribs.

**Fig. 15.** Conta delle coste.

**Inner lip** with 7-8 weak plications in correspondence of the spiral cords. Posterior sinus as wide as ramp.

**Siphonal fasciole** with 7-8 strong and aculeate cords.

**Coloration** uniformly whitish-yellowish.

## Distribution

**Middle Miocene:** France - Manthelan (Touraine) (fide Ivolas & Peyrot, 1900: 119).

**Lower Pliocene (Zanclean):** Italy - Gravina (Bari), (fide Tiberi, 1869: 261); Altavilla (Palermo), (BRU); Zinola (Savona), (MRSNT, coll. Bellardi-Sacco); Ciuciano (Siena, (BRU); Monsindoli (Siena), (fide Chirli, 1997: 82); La Torretta (Cuneo), (fide Chirli, 1997: 82); La Sterza (Pisa), fide Chirli, 1997: 82); Ceriale, Rio Torsero (Savona), (CRO); Monte Mario (Roma), (fide Cerulli-Irelli, 1910: 56).

**Upper Pliocene (Piacenzian):** United Kingdom - Sutton (Suffolk), Coralline Crag, (fide Bell, 1871: 356); Italy - Astigian Basin (MRSNT, coll. Bellardi-Sacco); Masserano (Biella) (fide Zuffardi-Comerci, 1929); Caranchi (Savona) (CRO); Tabiano (Parma); Campore (Parma); Castell'Arquato (Piacenza), (BRU), Rio Carbonari (Piacenza), (BRU); Rio Crevalesse (Piacenza), (BRU); Torrente Stirone (Parma), (BRU); Monteveglio Ca' Lametta (Bologna), (BRU); Orciano Pisano (PAG); Guidonia (Roma) (BRU); Messina (fide Harmer, 1915: 240); Altavilla (Palermo) (REI).

**Lower Pleistocene (Gelasian):** Italy - Torrente Arda (Piacenza), (BRU); Torrente Stirone (Parma), (BRU); San Polo d'Enza (Reggio Emilia), (SCA); Maiola (Bologna), (BRU); Vallebiaia (Pisa), (fide Socin, 1941: 10), Rhodes - Ypsenis, (fide Chirli, 2011: 173).

**Middle Pleistocene (Calabrian):** United Kingdom - Little Oakley (Essex), (fide Harmer, 1915: 240); Italy - Pontasso (Pavia), (BRU); Pomezia cava Tacconi (Roma),





**Fig. 16.** **A.** *Pleurotoma hystrix* Pinna, 1971; **B.** *Raphitoma echinata* sensu AA., Mijet Is. (Croatia), h: 9.2 mm. (**A.** photo courtesy Martina Paolini, MCSNM; **B.** photo courtesy by J. Prkić).

**Fig. 16.** **A.** *Pleurotoma hystrix* Pinna, 1971; **B.** *Raphitoma echinata* sensu AA., Mijet (Croatia), h: 9,2 mm. (**A.** foto di Martina Paolini, MCSNM; **B.** foto di J. Prkić).

(BRU); Terreti (Reggio Calabria), (CRO); Contrada Ogliastri (Siracusa), (BRU); Rhodes - Kritika and Tsambika (fide Chirli, 2011: 173)

## Remarks

*Pleurotoma hystrix* De Cristofori & Jan (1832: 10) is *nomen nudum* and thus unavailable (ICZN, 1999: Art. 12.1 & 12.3). Subsequently, Bellardi (1847: 85, pl. 4, fig. 14) described and figured *Pleurotoma histrix* [sic!] with a slightly different spelling, yet evidently referring to De Cristofori & Jan's taxon, basing figure and description on a specimen received by Jan. *Raphitoma histrix* Bellardi, 1847, as it can be judged from description and figure, conforms clearly to the concept of *Raphitoma hystrix* of almost all authors of the last 160 years. Pinna (1971) figured alleged "syntypes" of 28 taxa introduced by De Cristofori & Jan (1832). Those samples were part of a series of shells bought (August, 7<sup>th</sup> 1833) by Count Vitaliano Borromeo (on Jan's Catalogue) and subsequently donated to the Museo Civico di Storia Naturale of Milano in 1914 by his nephew Gilberto Borromeo. Pinna stated also that the original De Cristofori & Jan collection had gone lost. Pinna (1971: pl 76, fig. 1) while recognising Bellardi's authorship for the binome, figured a specimen marking it as "lectotype". This specimen fits neither the description nor the figure of Bellardi (1847), belonging rather to the complex of *Raphitoma echinata* (Brocchi, 1814). (see Fig. 16).

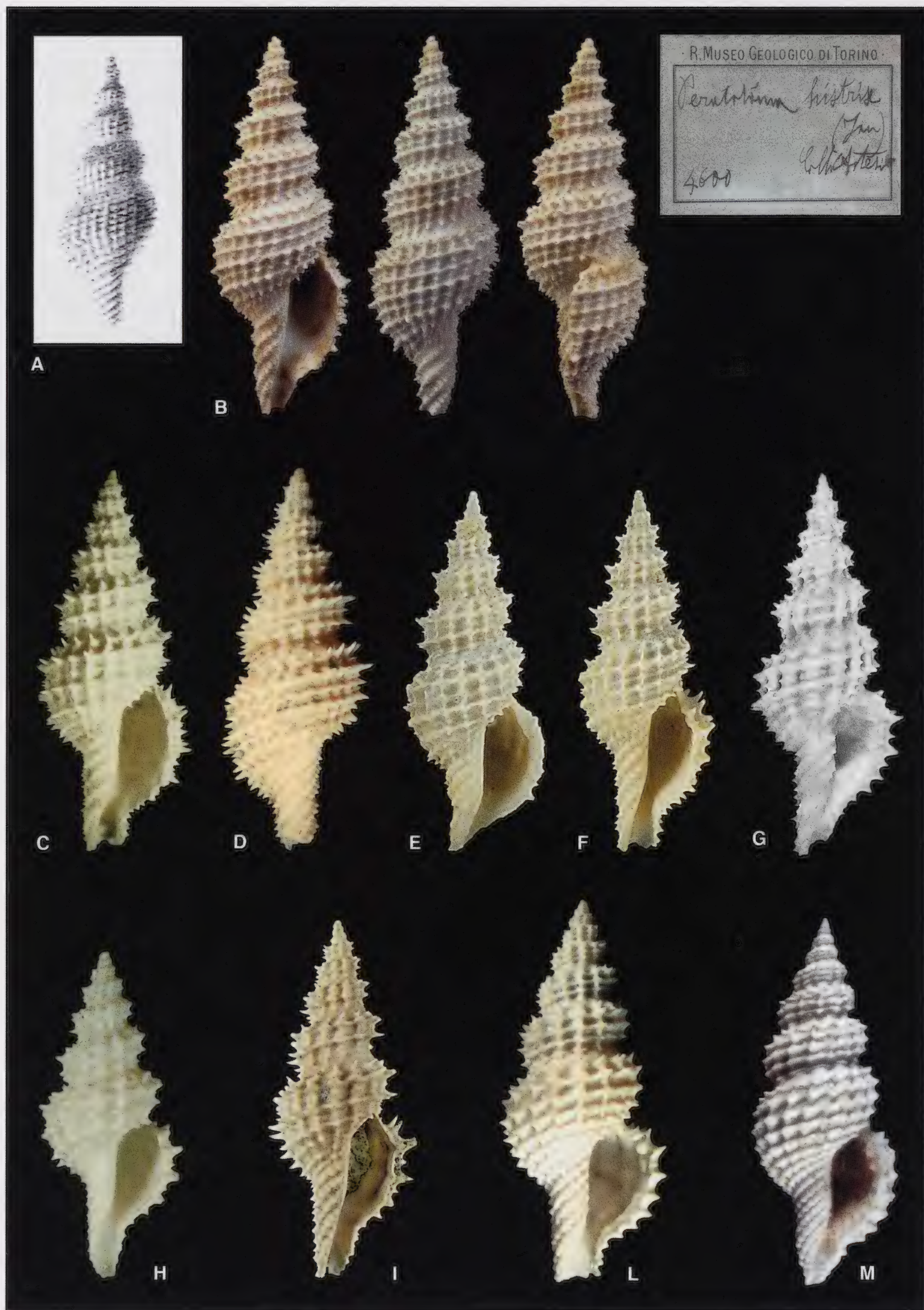
Lack of correspondence of the shell figured by Pinna with the specimen figured and described by Bellardi (1847) is probably due to a rehandling of Jan's materials between 1833 and 1971, as also supported by the statement of Pinna (1971: 424) that some labels were misplaced. Furthermore, Giorgio Jan certainly knew very well *Murex echinatus* Brocchi, having (correctly) included

it in his Catalogus (:9, n. 34) in the synonymy of *Pleurotoma reticulata* [Renier, 1807] (a name subsequently rejected by ICZN, 1956: Op. 427 as "not properly published in the manner prescribed by the code"). Therefore, the correct interpretation is that the original specimen of Jan, received and used by Bellardi (1847), is not in the collection at the Museum in Torino anymore (quite probably lost), and the specimen figured by Pinna (1971: pl 76, Fig. 1) was erroneously designed as lectotype, as it was certainly not part of the type series. Then under the ICZN (1999: Article 74.2) this designation is invalid. To stabilize the use of the binomen *Pleurotoma hystrix* Bellardi, 1847, it is therefore necessary to designate a neotype, conforming to the concept of this species of almost all authors, including Bellardi and quite certainly De Cristofori & Jan. We designate herein the specimen figured (Fig. 17B) from "Colli Astesi" (Pliocene - Piacenzian), (MRSN, Torino 011.16.008).

The protoconch of the shell we have selected is incomplete but shows clear traces of diagonally cancellate sculpture on the PII, indicating a multispiral protoconch and a planktotrophic development.

*Raphitoma antonjanssei* Marquet, 1998, *nom. emend.* (from the Pliocene of Kallo, Belgium: Zanclean-Piacenzian) is a very closely related species, differing in the protoconch of 2.75 whorls, lacking a keel and showing two spiral cords, a more globose nucleus, and a steeper sub-sutural ramp (Fig. 18B). *Pleurotoma histrix*, sensu Nyst (1878: 46; 1878: pls. 3 figs 13a, b) from the Pliocene (Scaldisian of Belgium) and *Raphitoma histrix* sensu Van Regteren Altena (1965: 43, pl. 18) from the Pliocene of Netherland can be referred to *Raphitoma antonjanssei* Marquet, 1998. *R. antonjanssei* has been found also at Torrente Stirone (Gelasian) by Mauro Brunetti (pers. comm.), which represents the first record of *Raphitoma antonjanssei* for the Pleistocene (Fig. 18B).





**Fig. 17.** *Raphitoma hystrix* (Bellardi, 1847). **A.** Bellardi's original drawings; **B.** neotype, Colli Astesi (Pliocene, Piacentian), h: 17.6 mm; **C.** Ceriale, Rio Torsero [Savona] (Pliocene, Zanclean), h: 16.3 mm; **D.** Torrente Stirone [Parma] (Pliocene, Piacentian), h: 15.5 mm; **E.** Orciano Pisano [Pisa] (Pliocene, Piacentian), h: 10.2 mm; **F.** Orciano Pisano [Pisa] (Pliocene, Piacentian), h: 10 mm; **G.** Rodi (Pleistocene); **H.** Montevoglio Ca' Lametta [Bologna] (Pliocene, Piacentian), h: 8.7 mm; **I.** San Polo d'Enza [Reggio Emilia] (Pleistocene, Gelasian), h: 9.9 mm; **L.** Torrente Stirone [Parma] (Pleistocene, Gelasian), h: 15 mm; **M.** Altavilla [Palermo] (Pliocene).

**Fig. 17.** *Raphitoma hystrix* (Bellardi, 1847). **A.** Figura originale di Bellardi; **B.** neotipo, Colli Astesi (Pliocene, Piacenziano), h: 17,6 mm; **C.** Ceriale, Rio Torsero [Savona] (Pliocene: Zancleano), h: 16,3 mm; **D.** Torrente Stirone [Parma] (Pliocene, Piacenziano), h: 15,5 mm; **E.** Orciano Pisano [Pisa] (Pliocene, Piacenziano), h: 10,2 mm; **F.** Orciano Pisano [Pisa] (Pliocene, Piacenziano), h: 10 mm; **G.** Rodi (Pleistocene); **H.** Montevoglio Ca' Lametta [Bologna] (Pliocene, Piacenziano), h: 8,7 mm; **I.** San Polo d'Enza [Reggio Emilia] (Pleistocene, Gelasiano), h: 9,9 mm; **L.** Torrente Stirone [Parma] (Pleistocene: Gelasian), h: 15 mm; **M.** Altavilla [Palermo] (Pliocene).





**Fig. 18.** Protoconchs of: **A.** *Raphitoma histrix* Bellardi, 1847; **B.** *Raphitoma antonjanssei* Marquet, 1998.

**Fig. 18.** Protoconche di: **A.** *Raphitoma histrix* Bellardi, 1847; **B.** *Raphitoma antonjanssei* Marquet, 1998.

***Raphitoma pseudohystrix* (Sykes, 1906)  
(Figs 19 - 20, 21B)**

*Clathurella pseudohystrix* Sykes, 1906: 187  
*Pleurotoma histrix* sensu Brugnone, 1862: 28, pl. 1 fig. 21 (*pars*)  
*Defrancia histrix* sensu Tiberi, 1869: 253 (*pars*)  
*Defrancia hystrix* sensu Jeffreys, 1870: 82 non Bellardi 1847  
*Defrancia hystrix* sensu Weinkauff, 1870: 86 (*pars*)  
*Defrancia hystrix* sensu Monterosato, 1872b: 51  
*Pleurotoma hystrix* sensu Monterosato, 1874: 277  
*Pleurotoma* (*Defrancia*) *hystrix* var. *albida* Monterosato, 1875: 44  
 [nomen nudum]  
*Pleurotoma* (*Defrancia*) *hystrix* var. *rufa* Monterosato, 1875: 44  
 [nomen nudum]  
*Pleurotoma* (*Defrancia*) *hystrix* var. *variegata* Monterosato, 1875: 44  
 [nomen nudum]  
*Defrancia hystrix* [sic!] sensu Weinkauff, 1873: 11  
*Pleurotoma histrix* sensu Aradas & Benoit, 1876: 252  
*Pleurotoma hystrix* sensu Monterosato, 1878a: 106  
*Pleurotoma hystrix* sensu Monterosato, 1878b: 159  
*Pleurotoma hystrix* sensu Monterosato, 1880: 229  
*Clathurella histrix* sensu Monterosato, 1890: 187  
*Clathurella histrix* sensu Monterosato, 1891: 124  
*Clathurella histrix* sensu Locard, 1891: 68 non Bellardi, 1847  
*Clathurella hystrix* sensu Carus, 1893: 424 (*pars*) non Bellardi, 1847  
*Pleurotoma* (*Clathurella*) *hystrix* sensu Watson, 1897: 304  
*Clathurella* (*Cordieria*) *hystrix* sensu Kobelt, 1905: 357, pl. 96 fig. 20 (fig. not good)  
*Clathurella hystrix* sensu Harmer, 1915: 240, figs 25  
*Cordieria pseudohystrix* Monterosato, 1923: 10, fig. 14  
*Raphitoma hystrix* sensu Glibert, 1954: pl. 7 fig. 5  
*Raphitoma pseudohystrix* Powell, 1966: 125, pl. 20 figs 6-7  
*Philbertia hystrix* Priolo, 1967: 698  
*Raphitoma histrix* sensu Nordsieck, 1968: 175; pl. 29 fig. 94.10  
*Raphitoma hystrix* sensu Parenzan, 1970: 209, fig. 849  
*Raphitoma pseudohystrix* Coppini, 1974: 59, pl. 5 fig. 6  
*Raphitoma hystrix* sensu D'Angelo & Gargiullo, 1978: 152 (figured)  
*Raphitoma histrix* sensu Nordsieck, 1977: 50; pl. 15 fig. 118  
*Raphitoma histrix* sensu Bogi et al., 1980: 18, figs 1-2  
*Raphitoma hystrix* sensu Terreni, 1981: 40 n. 326, tav. 6 fig. 7  
*Raphitoma hispidula* sensu Nordsieck, 1982: 270, pl. 100 fig. 98-02  
*Philbertia pseudohystrix* Van Aartsen, Menkhorst & Gittenberger, 1984: 88, 91  
*Raphitoma divae* Carrozza, 1984: 152, figs 1-2  
*Raphitoma pseudohystrix* Bogi et al., 1986: 27, figs 9-16  
*Raphitoma pseudohystrix* Smriglio et al., 1987: 384, pl. 1, figs 12-14  
*Philbertia pseudohystrix* Sabelli et al., 1990: 45, 217

*Raphitoma pseudohystrix* Poppe & Goto, 1991: 44, 174  
*Raphitoma pseudohystrix* Cachia et al., 2001: 69, pl. 10, fig. 8  
*Philbertia pseudohystrix* Basso & Brusoni, 2004: 41  
*Raphitoma pseudohystrix* Repetto et al., 2005: 220 n. 909  
*Raphitoma pseudohystrix* Robin, 2008: 254 n. 14  
*Raphitoma pseudohystrix* Segers, Swinnen & De Prins, 2009: 40, 215, Plate 46, fig. 6  
*Raphitoma pseudohystrix* Vazzana, 2010: 71  
*Raphitoma pseudohystrix* Cossignani & Ardovini, 2011: 31, 327 figs a,b  
*Raphitoma pseudohystrix* Manousis, 2012: 180 (WI)  
*Raphitoma pseudohystrix* Trono & Macrì, 2013: 27, 35  
*Raphitoma pseudohystrix* Poggiani & Micali, 2018: 203, fig. 1

## Type Material

*Clathurella pseudohystrix* Sykes – Lectotype (5.1 x 2 mm), here designated, and 6 paralectotypes (NHMUK 20130109 - coll. E.R. Sykes Acc. No. 1825) with two autograph labels. all from Adventure Bank, 92 fathoms. *Raphitoma divae* Carrozza – Holotype + 4 paratypes, MNHN-IM-2000-2902, Tuscan Archipelago.

## Type locality

*Clathurella pseudohystrix* Sykes – Adventure Bank, 92 fathoms (c. 168 m). Sykes reported “Porcupine Exp. 1869-70 Station 50”, but according to Warén (1980: 58) stn 50 was on the Algerian coasts; we prefer to give credit to the autograph label.

*Raphitoma divae* Carrozza - Tuscan Archipelago.

## Material examined

The type material and:

Spain - Malaga, 1 sh (TRI).

Corsica - Capo Corso, 3 sh (BOG), 31 sh (CRO); Bastia 50 m, 2 sh (MCZR-M-16466), 1 sh (MCZR-M-16793), 1 sh (PAG).

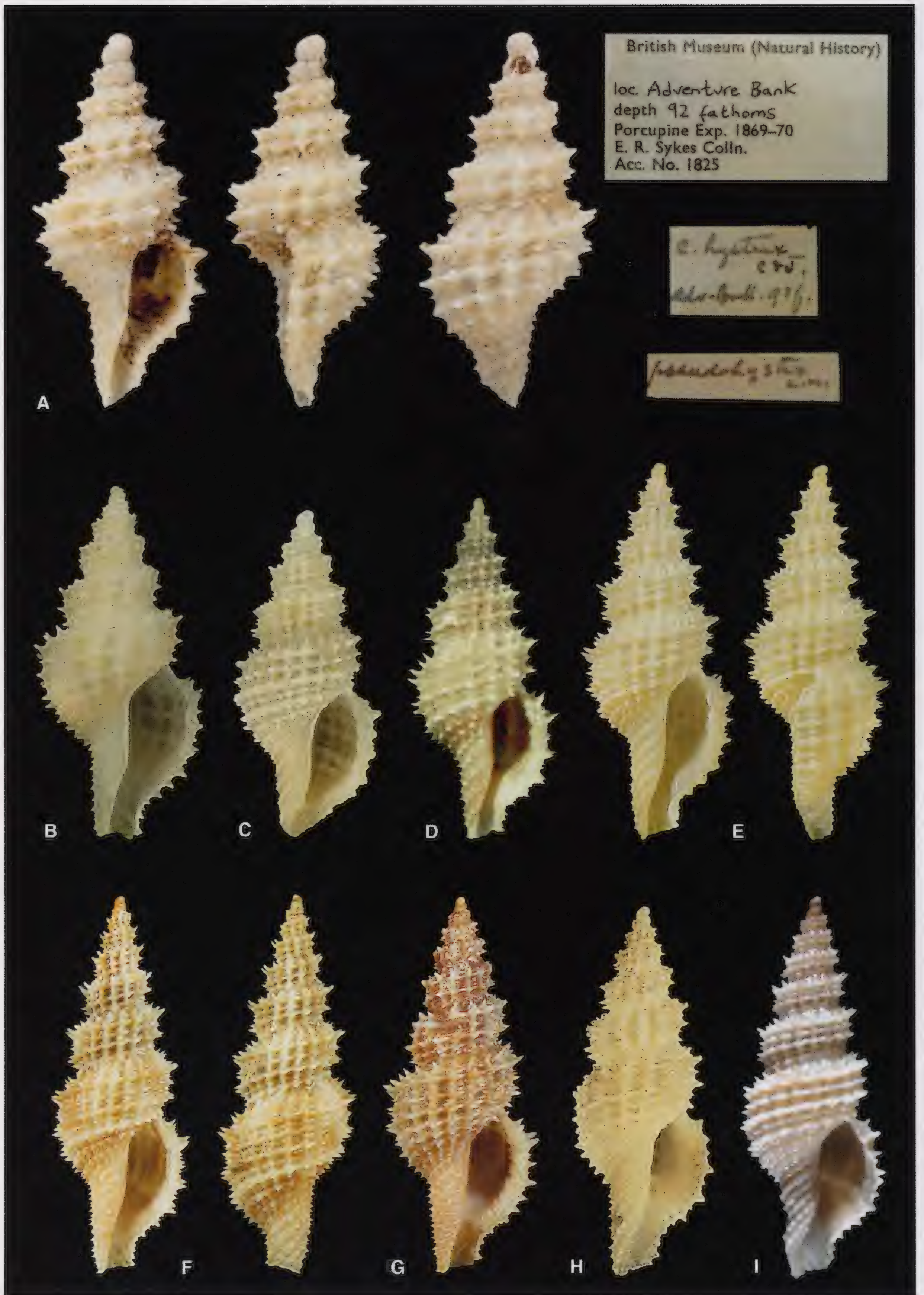
France - St. Raphael, 1 sh (MCZR-M-16466).

Sardinia - unprecised locality, 1 sh (MCZR-M-16466), Bocche di Bonifacio 1 sh (coll. Pizzini MCZR); Poetto (Cagliari), 2 sh (PIS); Capo Teulada (Cagliari), 1 sh (PIS); Poetto (Cagliari), 1 sh (PIS).

Sicily - Villafranca Tirrena (Messina), 1 sh (MCZR-M-16466); Pace (Messina), 1 sh (VIL); Porticello (Palermo), 2 sh (GIR); Termini Imerese (Palermo), 3 sh (PUS); Palermo, 1 sh (coll. Monterosato, MCZR-M-16466); Carini (Palermo), 2 sh (GIR); Golfo di Castellamare, 1 sh (MRSNT lot 24805); Trapani, 3 sh (coll. Monterosato, MCZ lot 16466); San Giuliano (Trapani), 1 sh MRSNT lot 25522, *sub nomine* *R. hystrix*; Trapani, 1 sh (coll. Melvill-Tomlin, NMW, lot 12926); Trapani, 1 sh (Melvill-Tomlin 12924 *sub nomine* var. *laxa*, Monterosato ms., 1 sh (PAG); Favignana Is., 1 sh (GER); Marettimo Is., 1 sh (PAG); Cala Calandra (Lampedusa Is.), 3 sh (coll. Pizzini MCZR), 6 sh forma *laxa* (CRO); Adventure Bank, 10 sh (coll. Melvill-Tomlin, NMW, lot 25169); Punta Cappelone (Lampedusa Is.) 45 m, 1 sh (CRO); dragage Princess Alice, Sud Sicilia 226 m, 7 sh (MCZR-M-16466).

Italy - Arcipelago Toscano, 1 sh (MAC), 1 sh (CRO);





**Fig. 19.** *Raphitoma pseudohystrix* (Sykes, 1906). **A.** lectotype (here designed, NHMUK, n. registration number 20130109), Adventure Bank (Sicily Channel), h: 5.1 mm; **B.** Mazara del Vallo (Trapani), h: 10 mm; **C.** Fiumicino (Roma), h: 8.7; **D.** Livorno, h: 8.2; **E.** Anzio (Roma), h: 10.5 mm; **F.** Anzio (Roma), h: 13 mm; **G.** Capraia Is., h: 13 mm; **H.** Palermo, h: 11.1 mm; **I.** Gorgona Is., h: 13.4. (**A.** photo courtesy Harry Taylor, NHMUK Photographic Unit; **D.** photo courtesy Morena Tisselli).

**Fig. 19.** *Raphitoma pseudohystrix* (Sykes, 1906). **A.** lectotipo (qui designato, NHMUK, numero di registrazione 20130109), Banco Avventura (Canale di Sicilia), h: 5.1 mm; **B.** Mazara del Vallo (Trapani), h: 10 mm; **C.** Fiumicino (Roma), h: 8,7; **D.** Livorno, h: 8,2; **E.** Anzio (Roma), h: 10,5 mm; **F.** Anzio (Roma), h: 13 mm; **G.** Capraia, h: 13 mm; **H.** Palermo, h: 11,1 mm; **I.** Gorgona, h: 13,4. (**A.** foto di Harry Taylor, NHMUK Photographic Unit; **D.** foto di Morena Tisselli).

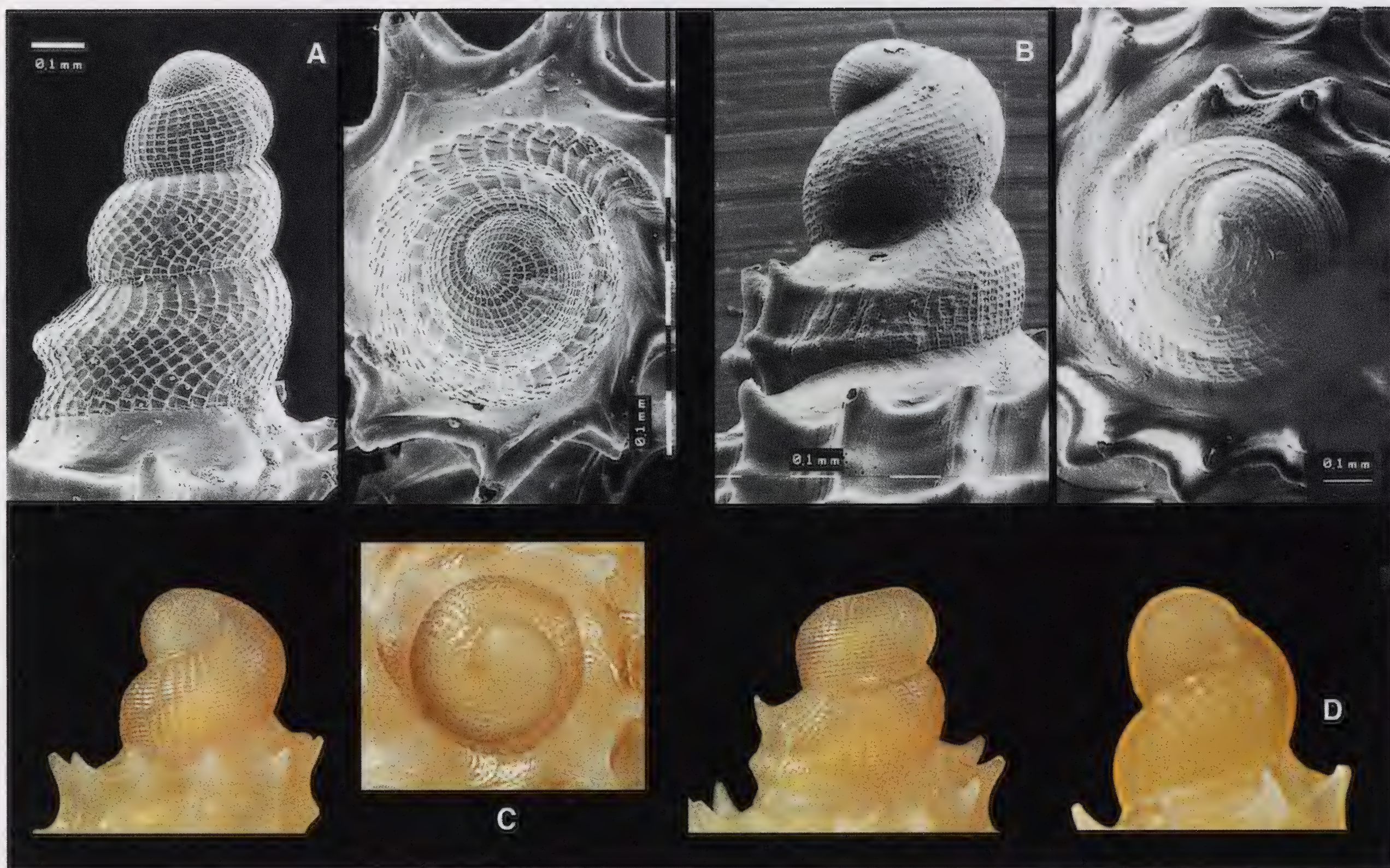




**Fig. 20.** *Raphitoma pseudohystrix* (Sykes, 1906). **A.** holotype of *Raphitoma divae* Carrozza, 1984, Tuscany Archipelago, h: 9.9 mm, MNHN-IM-2000-2902; **B.** Capraia Is., h: 7.1 mm; **C.** Calafuria (Livorno), h: 10.4 mm; **D.** Cap Teulada, h: 11.2 mm; **E.** var. *laxa* Monterosato ms. (MCZR-M), Trapani, h: 7.1 mm; **F.** Brindisi, h: 7 mm; **G.** particular of inner denticles; **H.** Capraia Is., h: 1.7 mm; **I.** var. *frigida*, Monterosato, 1923, Ficarazzi (Pleistocene, Calabrian), NMW lot 12923, h: 9.4 mm.

**Fig. 20.** *Raphitoma pseudohystrix* (Sykes, 1906). **A.** olotipo di *Raphitoma divae* Carrozza, 1984, Arcipelago Toscano, h: 9,9 mm, MNHN-IM-2000-2902; **B.** Capraia, h: 7.1 mm; **C.** Calafuria (Livorno), h: 10,4 mm; **D.** Capo Teulada, h: 11,2 mm; **E.** var. *laxa* Monterosato ms. (MCZR-M), Trapani, h: 7,1 mm; **F.** Brindisi, h: 7 mm; **G.** particolare dei denti lirati; **H.** Capraia, h: 1,7 mm; **I.** var. *frigida*, Monterosato, 1923, Ficarazzi (Pleistocene, Calabrian), NMW lot 12923, h: 9,4 mm.





**Fig. 21.** **A.** *Raphitoma hystrix* Bellardi, 1847, protoconch; **B.** *Raphitoma pseudohystrix* (Sykes, 1906), protoconch; **C, D.** *Raphitoma pseudohystrix* protoconchs.

**Fig. 21.** **A.** *Raphitoma hystrix* Bellardi, 1847, protoconca; **B.** *Raphitoma pseudohystrix* (Sykes, 1906), protoconca; **C, D.** *Raphitoma pseudohystrix* variabilità della protoconca.

Gorgona Is., 5 sh (BOG), 1 sh (PAG); Capraia Is., 11 sh (BOG), 2 sh (PAG); Secca delle Vedove (Arc. Toscano), 1 sh (BOG), 14 sh (PAO); St. Lucia Bank (Livorno), 1 sh (BAR); Ostia (Roma), 4 sh (PIE); Fiumicino (Roma), 19 sh (BOG), 1 sh (TRI); Terracina (Roma), 2 sh (TRI); Torre Astura (Nettuno), 1 sh (TRI); Isola Zannone, 2 sh (FUM); Capri Is., 1 sh (MCZR-M-16466); Ponza Is., 7 sh (CRO); Vibo Valentia, 1 sh (PUS); Capo d'Otranto, 1 sh (MAC); Taranto, (MCZR-M-16466).

Malta – *sine loco*, 1 sh (MCZR-M-16466), 2 sh (MCZR-M *sine numero*), *sine loco*, 1 sh (GUB).

Lybia – Bengasi, 1 sh (MCZR-M-16466); *sine loco* (MNW, lot 19523).

Croatia – *sine loco*, 1 sh (MIC). Velirat Is., (MCZR-M-16466).

#### Description [in square brackets the data of the holotype]

Shell of small-medium size for the genus height: 5-15 mm mean: 8.2 DS: 1.92 [5.1], width: 2-5.2 mm, mean: 3.90 DS: 0.65 [2]. Fragile, fusiform, slender, H/W: 2.22-3.08, mean: 2.54, DS: 0.22 [2.5].

**Protoconch paucispiral** (Fig. 21B-D), only protoconch I of 1.9 convex whorls, height: 600 µm, width: 574 µm; sculpture irregularly cancellate, variable in shape and size: more or less elated with more or less protruding nucleus. **Protoconch-teleoconch boundary** slightly indistinct but flexuose.

**Teleoconch** of 5-7 [5] convex and stepped whorls, weak

suture and strong sculpture. No microgranules on the surface. **Axial sculpture** of 12-29 [14] orthocline or slightly opisthocline ribs, and interspaces wider (×3) than the ribs. **Spiral sculpture** of primary cords stronger than the axials, and (starting on the fourth whorl) secondary cordlets occasionally present in large shells. Up to 9 cordlets above the aperture (primary and secondary). Cancellation sharp rectangular, with spinulose processes of correspondent size at the intersections. Sculpture visible in transparency throughout the internal shell wall.

**Subsutural ramp** wide, smooth, slightly concave, delimited by low but spinose first spiral cord. Older posterior sinus marks visible on the ramp.

**Columella** simple, slightly sinuous anteriorly. Siphonal canal long and sinuose.

**Outer lip** with 12-20 weak plications in correspondence of spiral cords and cordlets.

**Aperture** narrow and elongate. Posterior sinus as wide as the ramp.

**Siphonal fasciole** with 7-9 spinulose cords.

**Coloration** uniformly whitish or yellowish often with brownish blotches of variable size.

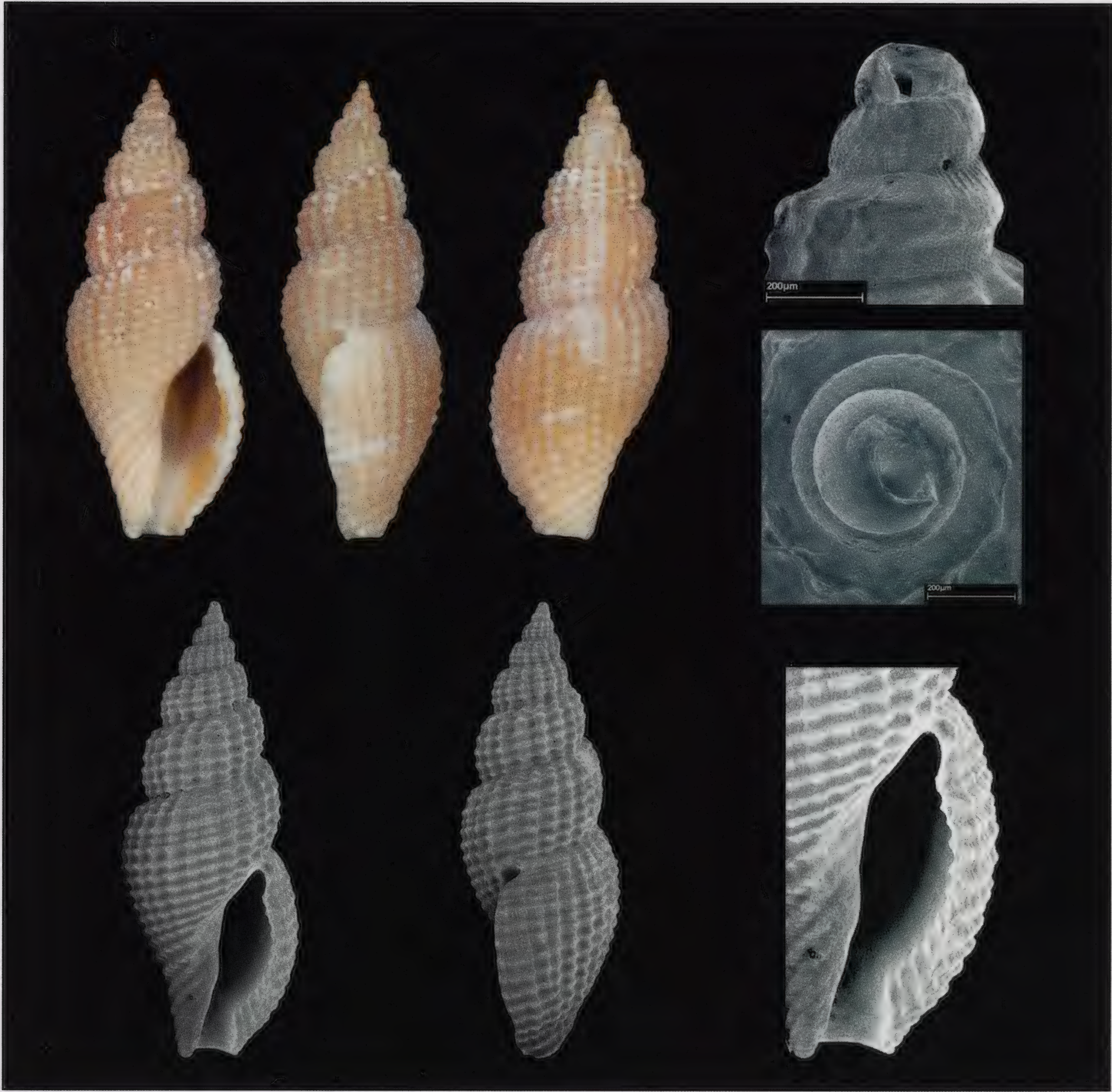
**Soft parts** body entirely white. Foot sharply bilobed anteriorly.

#### Distribution

Middle Pleistocene (Calabrian).

Rio Gisolo (Piacenza), (BRU); Archi (Reggio Calabria), (CRO); Terreti (Reggio Calabria), (CRO); Ficarazzi





**Fig. 22.** *Raphitoma oblonga* (Jeffreys, 1867). Holotype (USNM, Washington n. 190029), locality not precised, (h: mm 11; d: 4.1).

**Fig. 22.** *Raphitoma oblonga* (Jeffreys, 1867). Olotipo (USNM, Washington n. 190029), località imprecisata, (h: mm 11; d: 4,1).

(Palermo), (Monterosato coll., MCZR 12923, labelled “var. frigida”).

#### Recent

Funchal (Madeira) fide Watson, 1897: 304 and Segers, Swinnen & De Prins (2009: 40); Western, Central Mediterranean and Adriatic.

In rather deep waters (120-700 m), on the continental slope, but also in bathyal depths, found also in the white coral assemblages of the Central Tyrrhenian Sea (fide Smriglio et al., 1987).

#### Remarks

The listing by Koukouras, 2010 for the Aegean Sea has never been reliably confirmed. The record from Thermaikos Gulf (Greece) by Manousis, 2012: 180 is due to a wrong identification (multispiral protoconch).

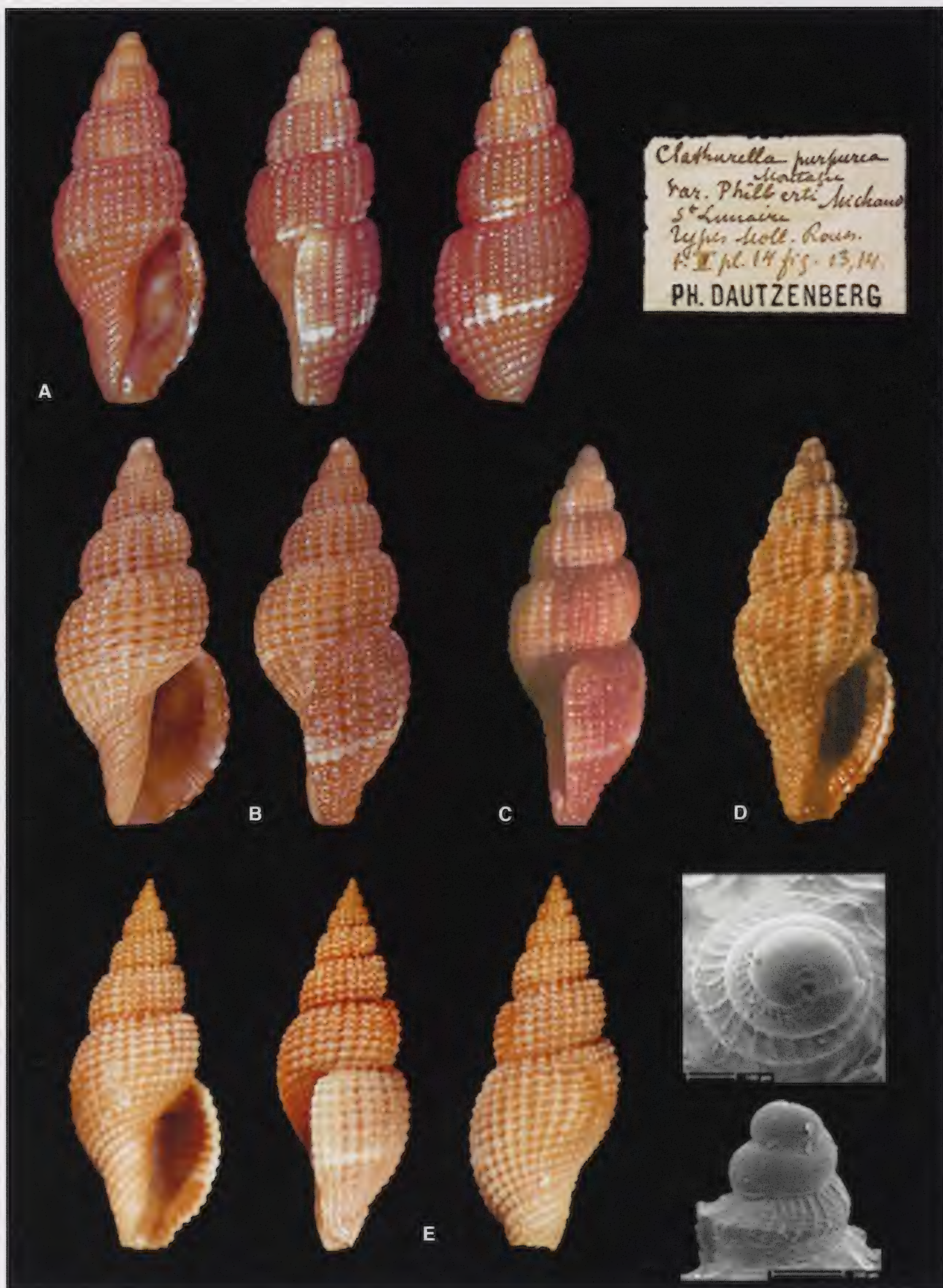
Old authors, from Brugnone (1862: 28) to e.g. Kobelt

(1905: 357) frequently confused *R. histrix* with *R. pseudohystrix*. Only Jeffreys (1870: 82) had already precised that the recent form had (at variance with the fossil) a paucispiral apex (“twisted and spirally striated, like that of *Trophon*”). Harmer (1915: 240) included under *Clathurella histrix* both species, fossil and Recent, notwithstanding Sykes (1906: 187) had already separated the two entities based on the protoconch type. *R. pseudohystrix* is rather variable in sculpture, ranging from as few as 12 axials (in the variety *laxa* Monterosato ms.) (Fig. 20E) to as many as 29 axials in the form described as *R. divae*, Carrozza, 1984 (Fig. 20A) with all intermediates.

#### *Raphitoma oblonga* (Jeffreys, 1867) (Figs 22-25A)

*Defrancia purpurea* var. *oblonga* Jeffreys, 1867; vol. 4: 374 pl. 89 fig. 6





**Fig. 23.** *Raphitoma oblonga* (Jeffreys, 1867) **A.** *Clathurella purpurea* var. *philberti* Michaud, St. Lunaire, original specimen depicted by B.D.D., Moll. Roussillon, pl. 14 fig. 13, 14 with autograph label by Dautzenberg (MNHN); **B.** *Clathurella servaini* Locard, 1891, lectotype here designed from St. Malo, mm 11,3 x 4,7 (MNHN); **C.** *Clathurella delphinella* Locard ms. (MNHN); **D.** *Clathurella bucquoyi* Locard, 1891 non Locard, 1886 [= *Raphitoma densa* (Monterosato, 1884)] (MNHN); **E.** *Clathurella purpurea* var. *denseclathrata* Dautzenberg & Durouchoux, 1900, lectotype here designed from St. Lunaire, mm 12 x 4,9 (IRSNB).

**Fig. 23.** *Raphitoma oblonga* (Jeffreys, 1867) **A.** *Clathurella purpurea* var. *philberti* Michaud, St. Lunaire, esemplare illustrato da B.D.D., Moll. Roussillon, pl. 14 fig. 13, 14 con etichetta autografa di Dautzenberg (MNHN); **B.** *Clathurella servaini* Locard, 1891, lectotipo qui designato da St. Malo, mm 11,3 x 4,7 (MNHN); **C.** *Clathurella delphinella* Locard ms. (MNHN); **D.** *Clathurella bucquoyi* Locard, 1891 non Locard, 1886 [= *Raphitoma densa* (Monterosato, 1884)] (MNHN); **E.** *Clathurella purpurea* var. *denseclathrata* Dautzenberg & Durouchoux, 1900, lectotipo qui designato da St. Lunaire, mm 12 x 4,9 (IRSNB).



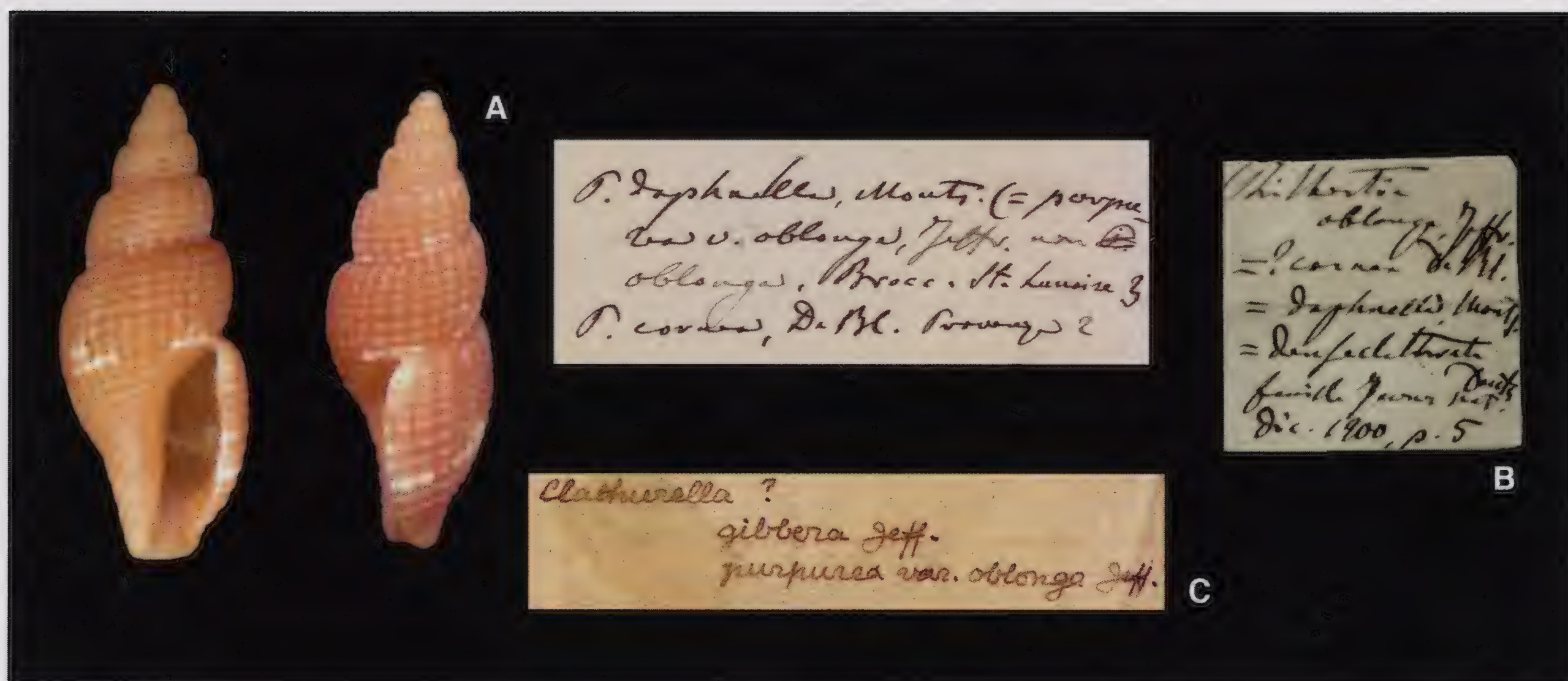


Fig. 24. A. *P. daphnella* Monterosato ms.; B. another Monterosato label with the synonymy; C. excerpt from the Marshall list sent to Monterosato.

Fig. 24. A. *P. daphnella* Monterosato ms.; B. altra etichetta di Monterosato con sinonimia; C. Estratto della lista inviata da Marshall a Monterosato.

*Defrancia purpurea* var. *oblonga* B.D.D., 1883: 91

*Clathurella purpurea* var. *philberti* sensu B.D.D., 1883 non  
Michaud, 1829: pars t. 1 pl. 14 fig. 13 and 14

*Philbertia contigua* Monterosato, 1884: 133 – pars

*Clathurella buquoyi* Locard, 1886: 113

*Philbertia contigua* Monterosato, 1884 sensu Dautzenberg, 1887

*Clathurella servaini* Locard, 1891: 65 (lectotype here designed)

*Clathurella purpurea* var. *denseclathrata* Dautzenberg & Durouchoux, 1900: 43

*Defrancia purpurea* var. *oblonga* J. Marshall, 1912

*Clathurella purpurea* var. *denseclathrata* Dautzenberg & Durouchoux, 1913: 14

*Defrancia purpurea* var. *oblonga* Warén, 1980: 34; pl. 6 fig. 13

*Defrancia purpurea* var. *oblonga* Chambers, 2008: 144

## Type material

*Defrancia purpurea* var. *oblonga* Jeffreys: holotype USNM, 190029 (11 x 4.1 mm), locality not precised. *Clathurella buquoyi* Locard: lectotype (MNHN), from Saint Lunaire, same specimen figured by B.D.D. (1883: figs 13, 14, as *Clathurella purpurea* var. *philberti* Michaud).

*Clathurella servaini*, Locard, MNHN (Paris) five lots all with autograph labels: lectotype (11.3 x 4.7 mm, here designated) and paralectotype (5.4 x 2.6 mm) St. Malo; paralectotype Cancale, 1 sh mm 12 x 5; paralectotype Belle Isle 1 sh; paralectotype Le Crosic 1 sh, white; paralectotype Hendaye 1 sh.

*Clathurella purpurea* var. *denseclathrata* Dautzenberg & Durouchoux, 1900, lectotype here designated from St. Lunaire, mm 12 x 4.9).

## Type locality

“off St. Catherine’s Bay, Jersey”, UK (the holotype has no locality label, however the original description reports “peculiar to the Channel Isles; I obtained it alive by dredging off St. Catherine’s Bay, Jersey, in 10-12 f. and dead at Guernsey, in 18 f.” - Jeffreys, 1867: 374).

*Clathurella buquoyi* Locard, Saint Lunaire (France).

*Clathurella servaini* Locard, St. Malo (France).

## Material examined

The type material and:

France: Brest 6 sh (coll. Locard, MNHN Paris, sub nomine *Clathurella delphinella* Locard ms.); Dinard 6 sh (coll. Locard, MNHN Paris, sub nomine *Clathurella delphinella* Locard ms.); Cancale 6 sh (coll. Locard, MNHN Paris, sub nomine *Clathurella delphinella* Locard ms.); St. Malo 6 sh (coll. Locard, MNHN Paris, sub nomine *Clathurella delphinella* Locard ms.); Saint Lunaire, 2 sh (MNHN, Paris, sub nomine *Clathurella purpurea* var. *philberti* sensu B.D.D. non Michaud), 1 sh SMNH (dedit Del Prete); Ploubazlanec, > 10 sh (LEQ); 33 sites (dredgings and beaches) in the Gulf of St. Malo, c 580 sh (IRSNB, Dautzenberg legit 1892-1910) sub nomine *Clathurella purpurea* var. *denseclathrata*.

## Description [in square brackets the data of the holotype]

Shell of medium size for the genus height: 9-14 mm, mean: 11, DS: 1.45 [11], width: 3.4-5.6 mean: 4.3 DS: 0.5 [4.1]. Solid, subfusiform (H/W: 2.24-3.15 mean: 2.53, DS: 0.16) [2.68].

**Protoconch multispiral** of 2.6 convex whorls, height: 480 µm, width: 370 µm: protoconch I of 0.7 whorls, width: 230 µm, covered by thin cancellations, protoconch II with diagonally cancellate sculpture starting after a wide zone under the suture with fine axial threads. Last whorl showing a short keel before the onset of the teleoconch. **Protoconch-teleoconch boundary** slightly flexuose, opisthocline.

**Teleoconch** of 6-8 [7] convex whorls. No microgranules on the surface. **Axial sculpture** of 16-31 [26] orthocline ribs, and interspaces wider (×1.5) than the ribs. **Spiral sculpture** above the aperture of 4-9 [8] slightly narrower than the axial ribs. Cancellation rectangular,





**Fig. 25. A.** *Raphitoma oblonga* (Jeffreys, 1867), Saint Malo, h: 9.9; **B.** *Raphitoma purpurea* (Montagu, 1803), Ploubazlanec: h: 8.00.

**Fig. 25. A.** *Raphitoma oblonga* (Jeffreys, 1867), Saint Malo, h: 9,9; **B.** *Raphitoma purpurea* (Montagu, 1803), Ploubazlanec: h: 8,00.

with low, broad, closely set and hardly detected tubercles at the intersections.

**Subsutural ramp** narrow, with small tubercles in correspondence with the axial ribs tip.

**Columella** simple, slightly sinuous anteriorly, gently angled posteriorly.

**Outer lip** with 10-13 strong inner denticles [12] the most anterior delimiting the siphonal canal, the most posterior delimiting the anal sinus.

**Siphonal fasciole** with 7-8 weakly nodulose cords.

**Coloration** uniformly tawny-reddish, salmon-pinkish in beached specimens. White spiral blotches aside the peristome as broad as 4-5 cordlets.

**Soft parts.** "Body light grey, mottled with purple: *pallial tube* long, purplish-brown, finely wrinkled; *tentacles* rather short, cylindrical, light grey; lower portion speckled with white; *eyes* on long stalks amalgamated with the tentacles, about halfway up the latter; *foot* narrow; front indented in the middle, with angular corners; hinder part finely pointed; sole white." (Jeffreys, 1867).

## Distribution

The Channel Isles, the coast from Saint Malo and St. Lunaire, and Brest (MNHN). There is a not verified record from Salema (Algarve, Portugal) from fishing nets at -60 m (private collection).

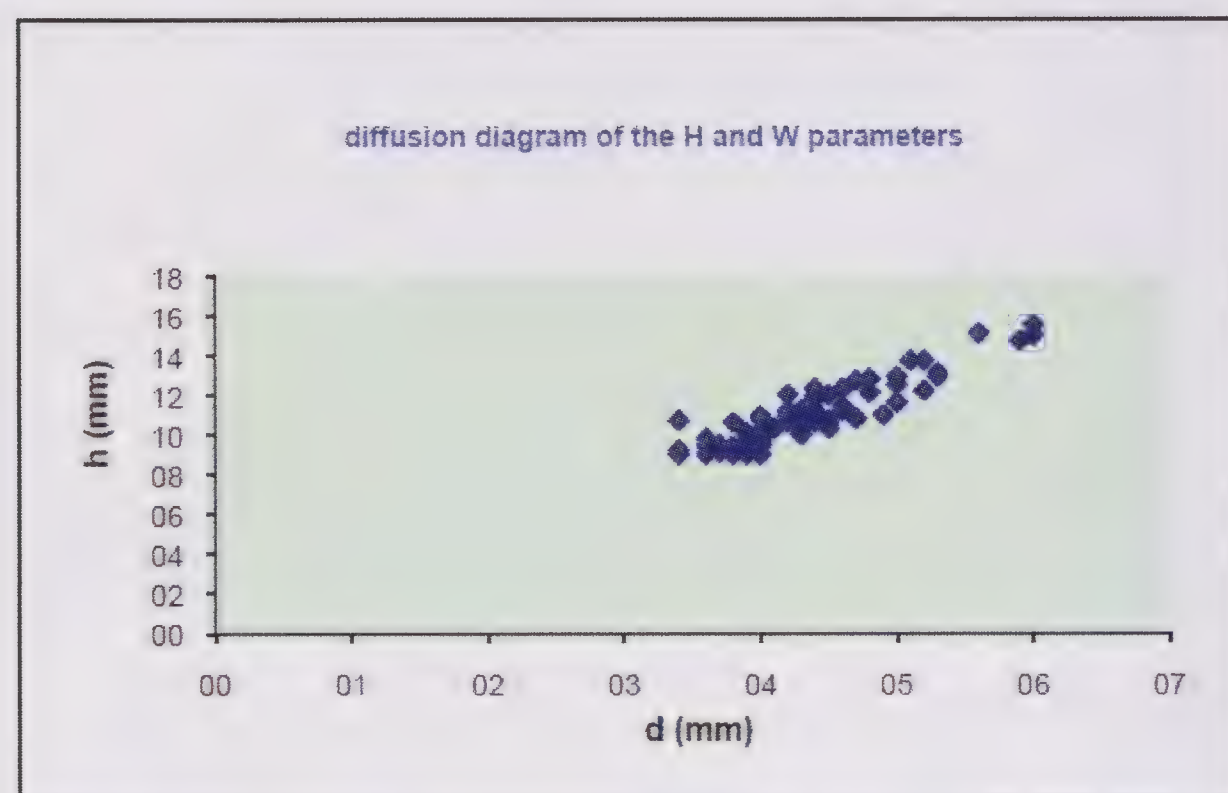
## Remarks

*Raphitoma oblonga* differs from *R. purpurea* by its fusiform-pupoid outline (*vs.* fusiform-acute in *R. purpurea*), by the more numerous, less elevated and always ortho-cline axials (*vs.* mostly opisthocline in *R. purpurea*), its less marked suture, its tawny-reddish colour (*vs.* dark brown with whitish blotches and a white outer lip in *R. purpurea*), its shorter siphonal canal. (Fig. 25).

This very characteristic species has curiously been the source of a series of mistakes. B.D.D. (1883: 91) referred it to *Clathurella purpurea* "var. ex forma 2 La Vie Phil." (with reference to their pl. 14, figs 18 and 19). Albeit the shells in those figures are certainly referable to *Raphitoma laviae* (Philippi, 1844), yet they have nothing to do with *Raphitoma oblonga* (Jeffreys, 1867), which is instead figured by B.D.D. in the same plate (figs 13 and 14) under the name "*Clathurella purpurea* var. Phil[berti] (Mich.)" [sic] (Fig. 23A)

Monterosato (1884: 133) introduced *Raphitoma contigua*, referring also to the figures "13-15" (pl. 14) of B.D.D. and to his own material. The figure 15 of B.D.D. is *Raphitoma atropurpurea* Locard & Caziot, 1900. The material of *R. contigua* in the collection Monterosato has also nothing to do with *Raphitoma oblonga* (see Pusateri et al., 2012).

Locard (1886: 113) introduced *Clathurella bucquoyi* without a description but with reference to *Defrancia purpurea* (var.



**Table 2.** *Raphitoma oblonga* (Jeffreys, 1867). Diffusion diagram of the H and W parameter. 80 adult specimens measured (data available on request). Graphic courtesy of Ina Oliva.

**Tab. 2.** *Raphitoma oblonga* (Jeffreys, 1867). Diagramma di diffusione dei parametri H e W. misure effettuate su 80 esemplari adulti (dati disponibili a richiesta). Grafico di Ina Oliva.



*oblonga*) Jeffreys 1867 ("in British Conchology vol iv p. 274, pl. LXXIX [sic! it should be 374 pl. LXXXIX] fig. 6") and to "*Clathurella purpurea* (pars), B.D.D. 1883 Moll. Rouss., pl. XIV, fig. 13 et 14". The locality reported by Locard is "La Manche: Saint Lunaire, dans l'Ile et Vilaine", as in B.D.D. (1883: 91). The name *Clathurella bucquoyi* Locard, 1886 is then available by indication (ICZN, 1999: Art. 12.2.1). To stabilize the use of this name we designate the specimen from Saint Lunaire figured by B.D.D. (1883: figs 13 et 14; as "*Clathurella purpurea* var. *philberti* Michaud"), a typical *R. oblonga*, as lectotype of *Clathurella bucquoyi* Locard. Only subsequently did Locard (1891) provide an extensive description of *Clathurella bucquoyi*, reporting it as common in the Mediterranean, but unfortunately mixing it with other species including *Raphitoma densa*. Locard (1891: 65) introduced *Clathurella servaini* with a rather generic description that may apply to any *Raphito-*

*ma*. The five lots at MNHN (Paris) of *Clathurella servaini*, all with autograph labels, comprise only shells lacking the protoconch and worn. However, the shells from St. Malo and Cancale, are certainly referable to *Raphitoma oblonga*; the remaining shells are too damaged to allow a correct identification, although they do not look like *oblonga*, congruently with their localities, where *R. oblonga* is not present. We designate the shell from St. Malo (mm 11.3 x 4.7) as lectotype of *Clathurella servaini*, which thus becomes a junior synonym of *R. oblonga*. (Fig. 23B). Dautzenberg & Durouchoux (1900: 43) describing *Clathurella purpurea* var. *denseclathrata*, finally realized that *contigua* Monterosato is distinct from *purpurea*. The material at the IRSNB (Bruxelles) showed that the var. *denseclathrata* is in fact *R. oblonga*. We designate as lectotype, a specimen from St. Lunaire, mm 12 x 4.9) (Fig. 23E). *R. oblonga* is known with certainty only from the Chan-



**Fig. 26.** *Raphitoma alleryana* (Selliotti, 1889). **A.** Messina: lectotype designed here (MCZR-M-16662), h: 6.4 mm; **B.** Messina (NMW), h: 8.7; **C.** Messina: (MCZR-M-16662) h: 6.2; **D.** Messina: paralectotype (MCZR-M-16662) h: 5.3.

**Fig. 26.** *Raphitoma alleryana* (Selliotti, 1889). **A.** Messina. lectotipo qui designato (MCZR-M-16662), h: 6,4 mm; **B.** Messina (NMW), h: 8,7; **C.** Messina: (MCZR-M-16662) h: 6,2; **D.** Messina: paralectotipo (MCZR-M-16662) h: 5,3.



nel area. A list of species identified in a Mediterranean sample of the R/V *Porcupine* (1870 - staz. 56, 390 fms [713 m], 37°03' N, 011°36' E, NW of Pantelleria Is.: Warén, 1980), sent by James Thomas Marshall to Monterosato, reports "*Clathurella purpurea* var. *oblonga* Jeff.". (Fig. 24C). J.T. Marshall sold the samples to "two gentlemen" (*in litt.* to Monterosato, 22.V.1902), one of which was R. Sykes. In his collection at BMNH there is no trace of the "*Defrancia purpurea* var. *oblonga*" (Kathy Way, pers. comm.). We have no knowledge of other putative Mediterranean records of *R. oblonga*, with the exception of one shell with autograph label by Locard reading "*Clathurella delphinella*" "Corsica" (MNHN, Fig. 23C).

Monterosato, in an unpublished handwritten note (University of Catania, "Archivio Monterosato" foglio LR113) had used the name *Philbertia daphnella* for "*purpurea* vs. *oblonga* Jeffr. non *oblonga*, Brocc." suggesting an homonymy issue with *Murex oblongus* Brocchi (currently a clathurellid in the genus *Comarmondia*). The ms. can be dated between 1886 and 1900. In an autograph label of *Philbertia daphnella* Monterosato ms., at MCZ (Rome), Monterosato wrote: "*Philbertia oblonga*, Jeffr. / =? cornea de Bl. / = *daphnella*, Monts. / = *denseclathrata* Dautz / feuille Jeunes nat. dic. 1900, p. 5" (Fig. 24A) evidently recognising *Raphitoma oblonga* as a good species. Actually, even if the original description of *Pleurotoma cornea* Blainville, 1829 could attain to *R. oblonga*, the type (MNHN, Paris) actually belongs to a distinct species of the group of *R. bicolor*.

The abundant material (over 500 specimens) of *Raphitoma purpurea* var. *denseclathrata* (= *R. oblonga*) from a coastal strip of about 200 km from Granville, eastward to Saint-Brieuc (in the Gulf of Saint Malo) stored at the IRSBN allowed us to perform a biometric analysis. Despite the wide range of variation, distribution of data did not show any significant discontinuity addressing to intraspecific variability.

### *Raphitoma alleryana* (Sullioti, 1889) (Fig. 26)

*Philbertia alleryana* Sullioti, 1889a: 33

*Philbertia bofilliana* Sullioti, 1889b: 67 (unnecessary replacement name)

*Clathurella bofilliana* Carus, 1893: 426

*Raphitoma* (Ph.) *bofilliana* Nordsieck, 1977: 58

*Raphitoma alleryana* Nordsieck, 1977: 58

*Raphitoma* (*Philbertia*) *bofilliana* Piani, 1980: 156

*Philbertia bofilliana* Sabelli, Giannuzzi-Savelli & Bedulli, 1990: 44, 216, 412

*Raphitoma bofilliana* Poppe & Goto, 1991: 44, 173

? *Philbertia bofilliana* Demir, 2003: 114

*Raphitoma bofilliana* Oliver Baldovì, 2007: 39

*Raphitoma pruinosa* sensu Cossignani & Ardovini, 2011: 327 non Pallary, 1906

*Raphitoma bofilliana* Manousis, 2012: 178 (figured) [WI]

### Type material

Lectotype, here designated, MCZR-M-16662 (mm 6.4 ×

2.7), from Messina S. Raineri, and 37 paralectotypes (1 shell referable to *R. philberti*, the remaining ones to *Raphitoma alleryana*).

### Type locality

Messina S. Raineri.

### Material examined

The type material and:

Sardinia: Portoscuso (SW Sardinia), 1 sh (ARD)

Sicily: Messina, 8 sh with handwritten Monterosato's label (*sub nomine Philbertia alleryi* Sullioti, coll. Melvill Tomlin, NMW - 12917; 7 referable to *R. philberti*); Messina, 3 sh juv. with handwritten Monterosato's label (*sub nomine Philbertia alleryi* Sullioti, coll. Coen, HUI - 8076); Gulf of Termini Imerese, 1 sh (PUS); Lampedusa Is. 1 sh (OCC); Capo Passero 6.0 m, 1 sh (ARD).

Italy: Porto Venere, 1 sh (MCZR-M-16678, *sine nomine*, legit Del Prete); Messina, 4 sh (with anonymous label) and + 3 sh [with handwritten Monterosato's label reading "*Clathurella alleryana* - Sullioti/Messina (ex auct.)"] (coll. Monterosato MCZR-M-1662).

### Distribution

Only known from examined material.

### Description [in square parentheses the data of the lectotype]

Shell of small size for the genus, height: 6-11 mm, mean: 7.22 [6.4], width: 2.7-3.7, mean: 3.2 mm [2.7]. H/W: 2-2.47, mean: 2.27 [2.37]. Solid, subfusiform.

**Protoconch paucispiral**: Unfortunately all specimens examined only show traces of a paucispiral protoconch (partly corroded in the lectotype).

**Teleoconch** of 6-8 [6] convex whorls. No microgranules on the surface. **Axial sculpture** of 21-24 [21] orthocline ribs, interspaces wider (×1.5) than the ribs. **Spiral sculpture** 7-8 [8] above the aperture, slightly narrower than the axial ribs, interspaces as wide as the cordlets. Cancellation rectangular, but mostly obliterate by the broad rounded tubercles at the intersections.

**Subsutural ramp** very narrow.

**Columella** simple, slightly sinuous anteriorly.

**Outer lip** with 11-13 [11] weak inner denticles, the most anterior (seemingly the fusion of two denticles) delimiting the siphonal canal, the most posterior delimiting the anal sinus.

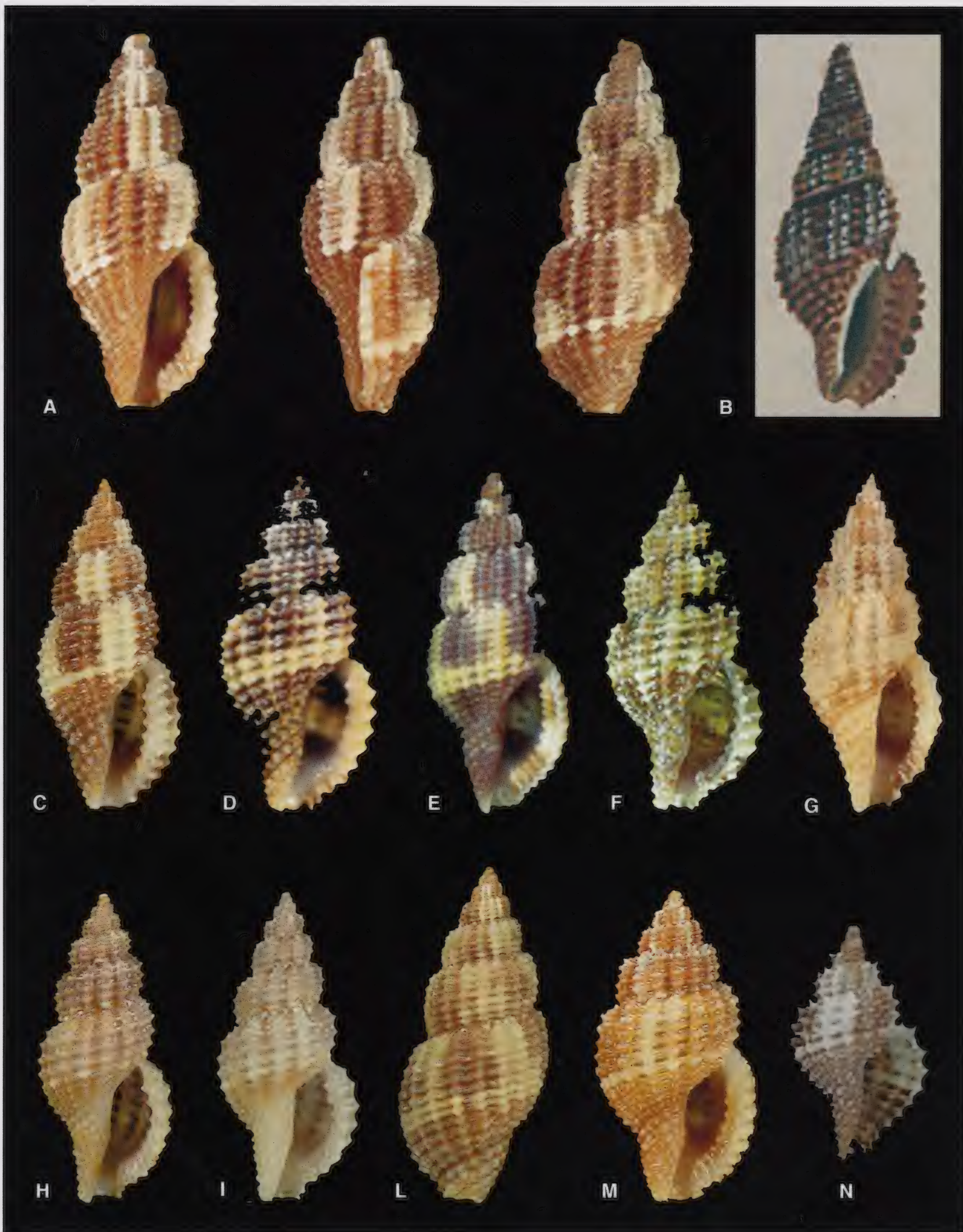
**Siphonal canal** short, open, slightly bent to right.

Siphonal fasciole with 9-11 weakly nodulose cordlets.

**Coloration** uniform light to dark salmon, with white spots of different size (from a few papillae to larger areas). White subsutural comma-shaped spots on the subsutural ramp in the last whorl (Fig. 26D). On the last whorl eight spiral cordlets and last two axial ribs partly white.

**Soft parts** unknown.

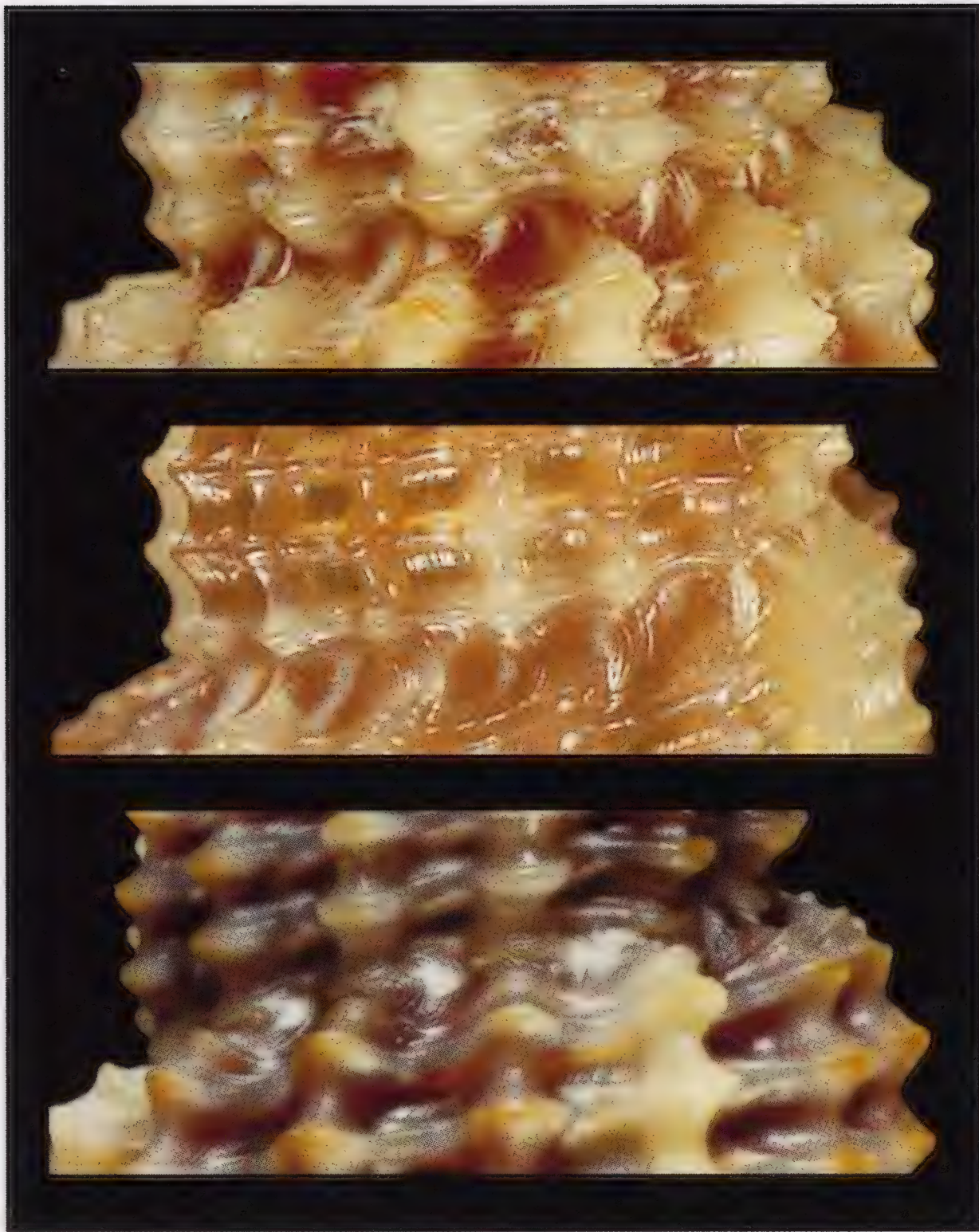




**Fig. 27.** *Raphitoma bicolor* (Risso, 1826); **A.** lectotype MNHN Paris n. MNHN - IM - 2000-2820, h: 10.08; **B.** Original drawing of *Pleurotoma bicolor* by Philippe Gény from his unpublished plates of Risso molluscs (Ms. 2052 - pl. 52) in "Bibliothèque Centrale du Museum National d'Histoire Naturelle de Paris"; **C.** Punta de la Mona (La Herradura: Spain), h: mm 8.5; **D.** Saint-Maxime (Var, France), h: mm 10; **E.** Gibraltar Strait, Targa – Ksar-es-Seghir (Morocco), h: mm 10.54; **F.** Lefkas Is. (Greece), h: mm 10.5; **G.** Punta Campanella – 40 m (Napoli), h: mm 10 (slender form); **H.** Corfù, h: mm 8; **I.** Castiglicello (Livorno), h: mm 9.7; **L.** Brucoli, h: mm 11.5; **M.** Kemer (Antalya, Turkey) (broad form) h: mm 8; **N.** Punta de la Mona (La Herradura, Spain), h: mm 2.7. (**D.** photo courtesy A. Hoarau; **E.** photo courtesy J. Ahuir; **F.** photo courtesy M. Bertolani).

**Fig. 27.** *Raphitoma bicolor* (Risso, 1826); **A.** lectotipo MNHN Paris n. MNHN - IM - 2000-2820, h: 10,08; **B.** disegno originale di *Pleurotoma bicolor* tratto dalle tavole inedite dei molluschi di Risso ad opera Philippe Gény (Ms. 2052 - pl. 52) in "Bibliothèque Centrale du Museum National d'Histoire Naturelle de Paris"; **C.** Punta de la Mona (La Herradura, Spagna), h: mm 8,5; **D.** Saint-Maxime (Var, Francia), h: mm 10; **E.** Stretto di Gibilterra, Targa – Ksar-es-Seghir (Marocco), h: mm 10,54; **F.** Lefkas Is. (Grecia), h: mm 10,5; **G.** Punta Campanella – 40 m (Napoli), h: mm 10 (forma allungata); **H.** Corfù, h: mm 8; **I.** Castiglicello (Livorno), h: mm 9,7; **L.** Brucoli, h: mm 11,5; **M.** Kemer (Antalya, Turkey) (forma larga) h: mm 8; **N.** Punta de la Mona (La Herradura, Spagna), h: mm 2,7. (**D.** Foto di A. Hoarau; **E.** foto di J. Ahuir; **F.** foto di M. Bertolani).





**Fig. 28.** *Raphitoma bicolor* (Risso, 1826); Details of the subsutural zone of three different specimens highlighting the secondary cordlets.

**Fig. 28.** *Raphitoma bicolor* (Risso, 1826); Particolare della zona sottosuturale di tre differenti esemplari dove si evidenziano i cordoncini secondari.

## Remarks

The original material of Sullioti at the Museo Civico di Storia Naturale "Doria", Genova, should be considered as lost (R. Poggi, pers. comm.). We have found a series of 38 syntypes in the Monterosato collection, with autograph label by Sullioti (MCZR-M-16662). Of the 38 shells, one is a *R. philberti*, the remaining ones are all

*Raphitoma alleryana*: all lack a complete protoconch, but two bear portions of a paucispiral protoconch.

It is very similar to *R. oblonga* from which it differs in the paucispiral protoconch, and in the white subsutural 'commas' marking the narrow subsutural ramp (never observed in *R. oblonga*). The posterior sinus may occasionally increase in size to the space of 3-4 axials. According to Sullioti the shell does not exceed 10 mm, and although we have not found specimens larger than 8 mm, it remains one of the smallest species of the genus.

## *Raphitoma bicolor* (Risso, 1826) (Figs 27-29, 31A)

*Pleurotoma bicolor* Risso, 1826: 214, n. 557

*Pleurotoma bicolor* Blainville, 1829: 108

*Pleurotoma elegans* Blainville, 1829 *non* DeFrance, 1826: 109 *nec* *Murex elegans* Donovan, 1804

*Pleurotoma cornea* Blainville, 1829: 111, pl. 4, figs 8, 8a

*Pleurotoma versicolor* var. *albo-maculata* Scacchi, 1836: 12 (*fide* Monterosato, 1884)

*Pleurotoma bicolor* Monterosato, 1877a: 43

*Pleurotoma* (Defrancia) *bicolor* Monterosato, 1877b: 425

*Pleurotoma bicolor* Monterosato, 1878: 106

*Pleurotoma bicolor* var. *gracilis* Monterosato, 1878: 106 (*nomen nudum*)

*Pleurotoma bicolor* var. *turgida* Monterosato, 1878: 106 (*nomen nudum*)

*Pleurotoma bicolor* Monterosato, 1880: 229

*Clathurella purpurea* var. *bicolor* B.D.D., 1883: 92, pl. 14 n. 16-17

*Clathurella bicolor* Dautzenberg, 1883: 326

*Philbertia bicolor* Monterosato, 1884: 132

*Pleurotoma bicolor* Tryon, 1884: 275

*Pleurotoma elegans* Blainville; Tryon, 1884: 341

*Clathurella bicolor* Locard, 1891: 66

*Clathurella bicolor* var. *albo-cinerea* Locard & Caziot, 1899: 248 (*nomen nudum*)

*Clathurella bicolor* var. *albo-fusca* Locard & Caziot, 1899: 248 (*nomen nudum*)

*Clathurella bicolor* var. *bicolor* Locard & Caziot, 1899: 248 (*nomen nudum*)



**Fig. 29.** *Raphitoma bicolor* (Risso, 1826); living animal (photo courtesy J. Prkić).

**Fig. 29.** *Raphitoma bicolor* (Risso, 1826); animale vivente (foto di J. Prkić).



*Clathurella bicolor* var. *curta* Locard & Caziot, 1899: 248 (*nomen nudum*)

*Clathurella bicolor* var. *elongata* Locard & Caziot, 1899: 248 (*nomen nudum*)

*Clathurella bicolor* var. *major* Locard & Caziot, 1899: 248 (*nomen nudum*)

*Clathurella bicolor* var. *minor* Locard & Caziot, 1899: 248 (*nomen nudum*)

*Clathurella bicolor* var. *ventricosa* Locard & Caziot, 1899: 248 (*nomen nudum*)

*Clathurella bicolor* Hidalgo, 1917: 248

*Philbertia* *bicolor* Pallary, 1938: 16

*Philbertia* (*Philbertia*) *bicolor* Priolo, 1967: 693

*Raphitoma* (*Cyrtoides*) *bicolor* Nordsieck, 1968: 176, pl. 30, fig. 94.25

*Raphitoma* (*Philbertia*) *bicolor* Bombace, 1969: 20

*Raphitoma* (*Philbertia*) *bicolor* Bombace, 1970: 15

*Raphitoma bicolor* Parenzan, 1970: 211, pl. 45, fig. 860

*Defrancia purpurea* sensu Parenzan, 1970: 211 non Montagu, 1803

*Raphitoma bicolor* Ghisotti, 1972: 63

*Raphitoma bicolor* Spada et al., 1973: 55 pl. 4 fig. 9

*Raphitoma* (*Cyrtoides*) *bicolor* Nordsieck, 1977: 53, pl. 16, fig. 127

*Raphitoma bicolor* D'Angelo & Gargiullo, 1978: 152 (figured)

*Raphitoma* (*Cyrtoides*) *bicolor* Nordsieck & García-Talavera, 1979: 163, pl. 41, fig. 26

*Raphitoma bicolor* Bogi, Coppini & Margelli, 1980 (134-135): 18, fig. 8

*Raphitoma bicolor* Corselli, 1981: 16

*Raphitoma bicolor* Terreni, 1981: 40

*Raphitoma bicolor* Luque & Templado, 1981: 27

*Raphitoma* (*Cyrtoides*) *bicolor* Templado & Llanso, 1981: 35, 37

*Raphitoma bicolor* Rolán, 1983: 267, fig. 253

*Raphitoma bicolor* Van Aartsen, Menkhorst & Gittenberger, 1984: 90

*Raphitoma bicolor* Ballesteros et al., 1986: 46

*Raphitoma bicolor* Orlando & Palazzi, 1985: 68, pl. 8, fig. 127

*Raphitoma bicolor* Luque, 1986: 91

*Raphitoma bicolor* Sabelli, Giannuzzi-Savelli, Bedulli, 1990: 216

*Raphitoma bicolor* Riedl, 1991: 269 pl. 104

*Raphitoma bicolor* Poppe & Goto, 1991: 173, pl. 35 fig. 20

*Raphitoma purpurea* sensu Delamotte & Vardala-Theodorou, 1994 non Montagu, 1803: 137, fig. 8

*Raphitoma bicolor* Spada in Bodon et al., 1995, 14:43

*Raphitoma bicolor* Giribet & Peñas, 1997: 52

*Raphitoma bicolor* Rolan et al., 1998: 100

*Raphitoma bicolor* Oztürk, Buzzurro & Benli, 2004: 59

*Philbertia bicolor* Cretella et al., 2004: 123, 124

*Raphitoma bicolor* Doneddu & Trainito, 2005: 148 (fig. 354 only first two specimens)

*Raphitoma bicolor* Repetto, Orlando & Arduino, 2005: 216, fig. 885

*Raphitoma bicolor* Brunet Navarro & Capdevila, 2005: 75, fig. 271

*Raphitoma bicolor* Trono, 2006: 68

*Raphitoma bicolor* Repetto, Bianco & Ciccimarra, 2011: 41, 96

*Raphitoma bicolor* Cossignani & Ardochini, 2011: 324 (with 7 figs)

*Raphitoma bicolor* Gofas, Moreno & Salas, 2011: 338 (with 1 fig.)

*Raphitoma bicolor* Vazzana, 2011: 60

*Raphitoma bicolor* Manousis et al., 2018: 8, figs 5a-c

## Type material

*Pleurotoma bicolor* Risso, lectotype MNHN-IM-2000-2820: h 10.08 mm and one paralectotype MNHN-IM-2000-2821:

h 9.65 mm, here designated (*sine loco*), *Pleurotoma elegans* Blainville - 1 syntype MNHN-2914: h 8.4 mm.

## Type locality

None.

## Material examined

The type material and:

Spain – Costa del Sol, 1 sh (RUF); Puerto Collon (Mallorca), 1 sh (MCZR Monterosato coll. *sine numero*); Formentera, 1 sh, (SMNH lot 73166E) leg. Alf Josefson, 4 sh (SMNH lot 70486) leg. F. Söderlund; La Herradura, 1 sh (AGA), 2 sh (MIC); Malaga, 1 sh (PUS); Punta de la Mona, 8 sh (BAR), 1 sh (PAG); Getares, 4 sh (PAG).

France – St. Raphael (Var), 4 sh (coll. Chaster, NMW 01893); Sainte-Maxime (Var), 1 sh (HOA); Iles Embiez, 1 sh (MNHN); Marseille, 1 sh (MNHN); 1 sh (coll. Couturier, MNHN).

Corsica – Unprecised locality, 3 sh (DEL); Ajaccio, 2sh (CRO); Baie de Calvi, 1 sh (SMNH lot 73171G leg. A. Warèn).

Sardinia – S. Teresa di Gallura (Olbia), 1sh (CRO); Alghero, 2 sh (BAL); Castelsardo (Sassari), >10 sh (BAR); Arzachena (Sassari), 1 sh (AGA); S'Archittu (Oristano), 17 sh (SOS); Capo Pecora, 2 sh (PIS); Poetto (Cagliari), 2 sh (PIS).

Sicily – Marettimo Is. 36 m, 1 sh (PAG); Favignana Is., 1 sh (PUS); San Vito Lo Capo (Trapani), 1 sh (PAG), 1 sh (BAR); Macari (Trapani), 1 sh (PAD); Trapani, 1 sh (PAG), 1 sh (PAD); Cala Rossa, Terrasini, 1 sh *sub nomine* *R. laviæ* (MRSNT 21809); Gulf of Carini, 2 sh (PAL); Isola delle Femmine (Palermo), 3 sh (PUS), Ustica Is., 2 sh (VIL); Ficarazzi (Palermo), 4 sh (PUS); Capo Milazzo, 3 sh (NOT); Messina, 2 sh (Monterosato [*sine nomine*] MCZR n. 16813 leg. Sullioti); Scalone (Messina), 1 sh (RAV); Acicastello (Catania), 2 sh (PAG), 1 sh (BOG); Acitrezza (Catania), 13+1 sh (SMNH lots 73198D+73199C); Acitrezza, Isola Lachea, 10 sh (SMNH lot 73197C); Cannizzaro (Catania), 16 sh (GER), 1 sh (MTS), 3 sh (BOG), 1 sh (MON), 2 sh 45 m (CRO), 3 sh (PAG); Ognina (Catania), 1 sh (GER), 7 sh (PAG); Pozzillo Inferiore (Acireale), 1 sh (PAG); Siracusa, 3 sh (PUS); Brucoli (Siracusa), 2 sh (SMNH lot 73204B), 1 sh (PUS); Porto Palo (Siracusa), 9 sh (GER); Ragusa, 1 sh (PAG); Scoglio Fortuna (Lampedusa Is.), 3 sh (CRO); Sicily Channel, 1 sh (PAG).

Italy – Riva Trigoso 20 m, 4 sh (REP), 10 sh (SOS); Sestri Levante (Genova), 3 sh (PUS); Tuscan Archipelago, 1 sh (RUF); Laconella (Elba Is.) 6 m, 1 sh (CRO); Sant'Andrea (Elba Is.), 3 sh (RAV); Giannutri Is., 4 sh (AGA); Giglio Is., 1 sh (BAL); Capraia Is., 1 sh (PAG); Secca delle Vedove 100/130 m, 5 sh (PAO); Calambrone (Livorno), 1 sh (BAL); Castiglioncello (Livorno), 12 sh (MAR), 4 sh (BAL), 1 sh (PAO), 2 sh (PAG), 2 sh (PAD); Vada (Livorno), 1 sh (PAG); Golfo Baratti, 10 sh (BAL), 1 sh (PAO); Punta Ala 5 m, 3 sh (REP); Tor Paterno (Roma), 33 m, 1 sh (RUF), 1 sh (PAG), 1 sh (PAD); S. Agostino (Gaeta), 3 sh (CRO), 1 sh (GER); Procida Is., 1 sh (PAL),



1 sh (CRO); Punta Pioppeto (Procida), 1 sh (PUS), 7 sh (CRO), 1 sh (MON); Capri Is., 3 sh (CRO), 2 sh *sub nomine* *P. crenata* (MCZR-M-16809); Capo Palinuro, 1 sh (RAV), 1 sh (PAG); Punta Campanella 40 m, 1 sh (PAG); Sapri (Salerno), 1 sh (RON); Maratea (Potenza), 3 sh (CAR); Cetraro (Cosenza), 1 sh (RON); Scilla (Reggio Calabria), 29 sh (VAZ), 1 sh (PAG), 1 sh 50 m (CRO); Secca di Pellaro, 2 sh (PAO); Lazzaro (Reggio Calabria), 1 sh (VAZ); Porto Cesareo (Taranto), 2 sh (AGA), 1 sh (FIO); Campomarino (Taranto), 32 sh *sub nomine* *R. rudis* (MRSNT 23653); Novaglie (Lecce), 1 sh (MAC); Giovinazzo (Bari), 2 sh (MEL); Santa Caterina (Lecce), 1 sh (TRO); Torre Serpe (Otranto), 2 sh (MAC).

Morocco – Targa, Ksar-es-Seghir, 1 sh (AHU); Bay of Tanger, 1 sh (Chaster, NMW 01890).

Tunisia – Sfax, 1 sh (PUS).

Croatia – Croatia, 1 sh (DEL); Pula, 1 sh (Chaster, NMW 01892); Krk Is., 2 sh (BAR); Korcula Is., 1 sh (MIC). Biograd, 6 sh (PRK); Veli Rat Is., 2 sh, *sub nomine* *C. carneola* Monts. [ms.] (Monterosato, MCZR-M-16468); Lastovo Is., 2 sh (PAG).

Greece – Lefkas Is., 1 sh (BER); Pefko (Skiros Is.) 6 m (CRO); Sani Beach, 1 sh (CRO); Sithonia (Chalkidiki), 1 sh (PAG).

Cyprus – 1 sh (BAR).

Turkey – Bozcaada Is., 1 sh (HAY).

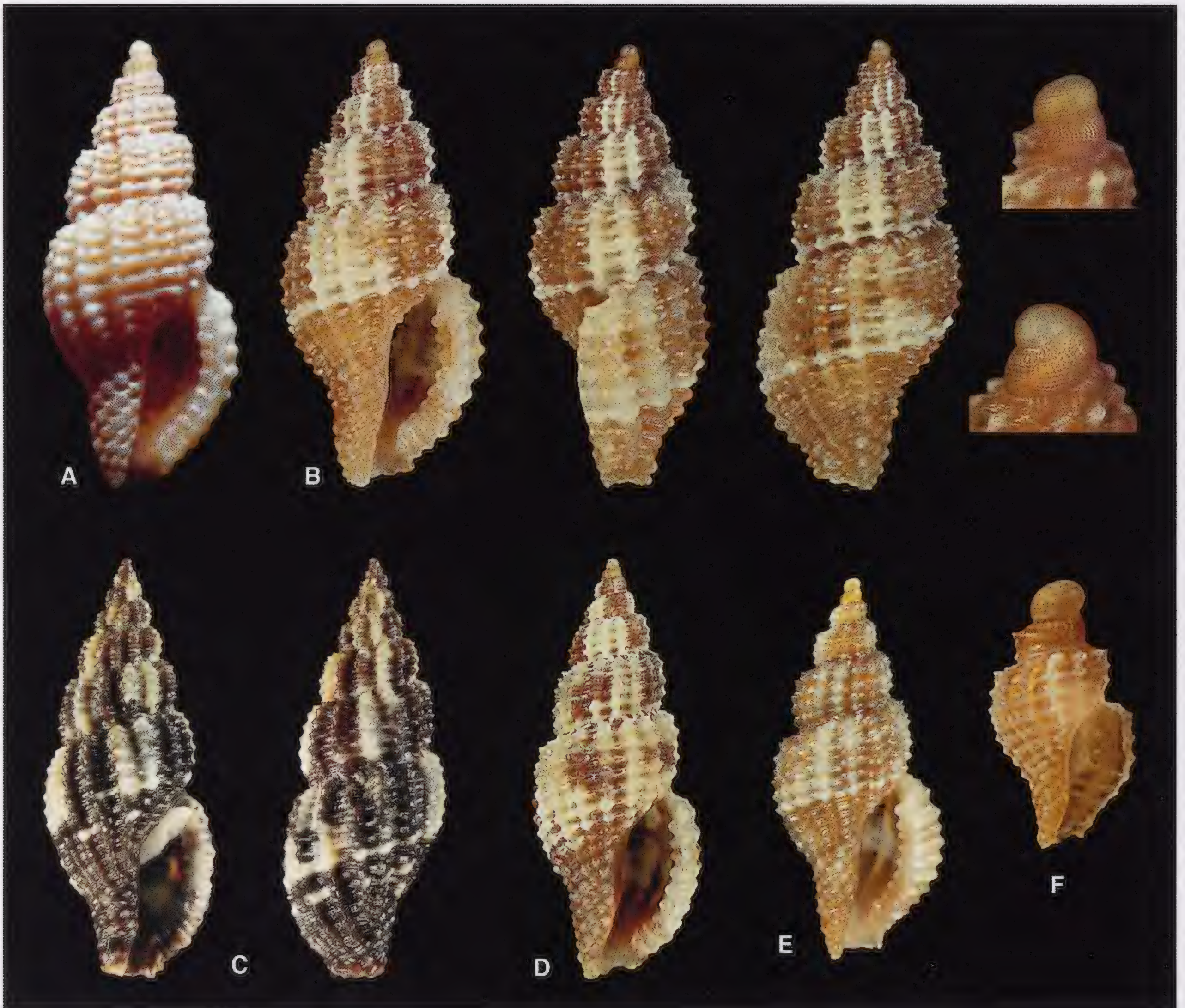
## Distribution

The entire Mediterranean Sea. Atlantic, from Wales to Canary Islands. Found on coarse sand-detritic bottoms in 1-50 m depth, occasionally down to 100 m in coralligenous habitat.

## Description [in square brackets the data of the lectotype]

**Shell** ovato-pupoid, of **medium size for the genus**, height: 8-11 mm [10.08], width: 3.5-3.9 mm [3.8]. H/W: 2.15-2.66 (mean: 2.36), DS: 0,33 [2.65].

**Protoconch multispiral** (Fig. 31A) of 2.7 convex whorls, height: 375 µm, width: 374 µm, protoconch: I of 1



**Fig. 30.** *Raphitoma farolita* Nordsieck, 1977; **A.** holotype (SFM), Ibiza, h: mm 7 x 3.2; **B.** Cannizzaro (Catania), h: mm 7.5; **C.** Campomarino (Taranto), h: mm 11; **D.** Capo Linaro, h: mm 10.5; **E.** Elba Is., h: mm 6.5; **F.** Cannizzaro (Catania), h: mm 2.5.

**Fig. 30.** *Raphitoma farolita* Nordsieck, 1977; **A.** olotipo (SFM), Ibiza, h: mm 7 x 3,2; **B.** Cannizzaro (Catania), h: mm 7,5; **C.** Campomarino (Taranto), h: mm 11; **D.** Capo Linaro, h: mm 10,5; **E.** Isola d'Elba, h: mm 6,5; **F.** Cannizzaro (Catania), h: mm 2,5.



whorls, width: 215 µm, covered by thin cancellations, protoconch II with a diagonally cancellate sculpture starting after a wide zone under the suture with fine axial threads. Last whorl with short keel before the onset of the teleoconch. **Protoconch-teleoconch boundary** slightly flexuose, opisthocline.

**Teleoconch** of 6-7 [6] convex whorls, stout, suture incised, sculpture robust. No microgranules on the surface; except for a very short stretch of the ramp in the initial part of the teleoconch. **Axial sculpture** of 16-22 [19] orthocline, equidistant ribs, and interspaces narrower than the ribs.

**Spiral sculpture** on the last whorl of 13-19 [15] cordlets, of which 5-7 [6] above the aperture. Cancellation rectangular, with strong and slightly elongated tubercles at the intersections.

**Subsutural** ramp narrow, with small tubercles in correspondence with the axial ribs tip and one or two small spiral cordlets.

**Columella** simple, slightly sinuous anteriorly, gently angled posteriorly.

**Outer lip** with 9 strong inner denticles, occasionally 8-11, the most anterior more robust and delimiting the short siphonal canal, the most posterior delimiting the shallow anal sinus.

**Siphonal fasciole** with 7-8 strong nodulose cords.

**Colour** uniformly brown in the background (from light to dark), with large whitish blotches, as wide as 1-3 axial ribs. Suprasutural cordlet (rarely two) whitish at least on the last whorl. Comma-shaped white spots on the subsutural ramp, occasionally also on the rest of the shell surface.

**Soft parts** foot sharply bilobed anteriorly, with a small papilla near each tip. Black eyes at proximal 1/3 of the tentacles. Foot and cephalic tentacle whitish hyaline semitransparent, with bright white speckles, head semitransparent dark grey, siphon dark grey sometimes with a yellowish stripe covered with white speckles.

## Remarks

Very rare specimens attaining up to 15 mm height are found. Rarely, shells uniformly light brown with only a white spiral cordlet, or with a predominantly whitish colour and brown blotches (or, more rarely, completely white) are also found. Specimens from eastern Mediterranean populations are darker, sometimes almost black.

It is one of the commonest species of *Raphitoma* in the Mediterranean Sea, yet the very brief original description and the great variability created some confusion. Monterosato, 1877: 43; 1878: 106; 1884: 132 considered *R. bicolor* and *R. philberti* as conspecific, an opinion shared by others (Brugnone, 1877; Tryon, 1884: 341; Locard, 1886: 112, Carus, 1896: 425; Marshall, 1912, Priolo, 1967: 693). B.D.D. (1883: 92) regarded “*bicolor*” as a mere variety of *R. purpurea*, but their concept of “*purpurea*” was rather wide, including also (as varieties) *R. laviae*, *R. philberti* and *R. lineolata*. Locard (1892: 66) considered *bicolor*

as a distinct species (but did not report *philberti*), as also did Locard & Caziot (1899: 60) who added the pupoid outline as diagnostic. Actually, *R. bicolor* has a colour pattern very similar to “*philberti*”, which is more slender ( $H/W > 2.4$ ), has a paucispiral protoconch, weaker sculpture, and the whitish blotches are hued posteriorly. Arnaud (1978: 109) reported “2 syntypes de 20 mm dans la collection Risso du Muséum (alors qu’il indique 12 mm!). Dans le même tube on trouvé 2 *Mangelia multilineolata* Desh. égarées.” We have found those 4 shells during our March 2004 visit to MNHN: 2 shells of *Mangelia undulata* (not *multilineolata*!), representing probably a short spire form of *Mangelia lineolata*, currently moved to a distinct vial; and the two syntypes which matched much more Risso’s original indication than Arnaud’s measurement. There are some further discrepancies among the original description, the illustration and the material examined by Arnaud and by us. Risso reported 8 spire whorls, whilst the larger syntype (the other is not usable) has 5 whorls. Risso reported fine sharp lines in the interstices, a characteristic of *R. purpurea* and lacking in *R. bicolor* as currently conceived. A collection of unpublished plates of Risso’s molluscs made by Philippe Gény between 1843 and 1844 is stored at the “Bibliothèque Centrale du Museum National d’Histoire Naturelle de Paris” (Ms. 2052). Arnaud (1978) who published some such plates, found that a number of those drawings do not match Risso’s diagnoses, a possible indication of re-handling of the collection already during Risso’s life. *Pleurotoma bicolor* is reported in the plate 52 of Gény collection (**Fig. 27B**): the acute outline matches more *R. purpurea* than *R. bicolor*; the size (shells are in scale, and Risso’s 12 mm seem correct) would be very unusual for *R. bicolor* but would fit a juvenile of *R. purpurea*; conversely the coloration pattern (including the outer peristome not white) fits rather well *R. bicolor*. Therefore, it is possible that the type series had been rehandled one or more times. However, since the largest syntype fits the largely prevailing concept of *Pleurotoma bicolor*, we think that there is no reason to change the current usage of the name. Considering *P. bicolor* as a *nomen dubium* (as proposed by Van Aartsen et al. 1984) would not increase stability, but rather would add confusion. The largest syntype is broken at the apex, but the few traces left indicate a multispiral protoconch. We designate hereby the largest syntype (h: mm 10.80) as lectotype of *Pleurotoma bicolor*. Among the species with multispiral protoconch *R. bicolor* is distinguished from *R. locardi* (**Fig. 40**) by being less slender (*R. locardi*  $H/W > 2.4$ ), by its more elevated sculpture and the white blotches not hued posteriorly. *R. bicolor* is distinguished from *R. ebreorum* n. sp. (**Fig. 48**) by its less fragile structure, the stronger sculpture, the fewer axials (*R. ebreorum*  $> 22$ ), the fewer denticles on the outer lip (*R. ebreorum*  $> 11$ ) and the white blotches not hued posteriorly. Finally, it is distinguished from *R. densa* (**Fig. 59B**) that has ash-grey blotches, lacks the suprasutural white cord, and has a more slender outline. Shells almost identical to *R. bicolor* are found in the Mediterranean Sea, differing by their paucispiral proto-



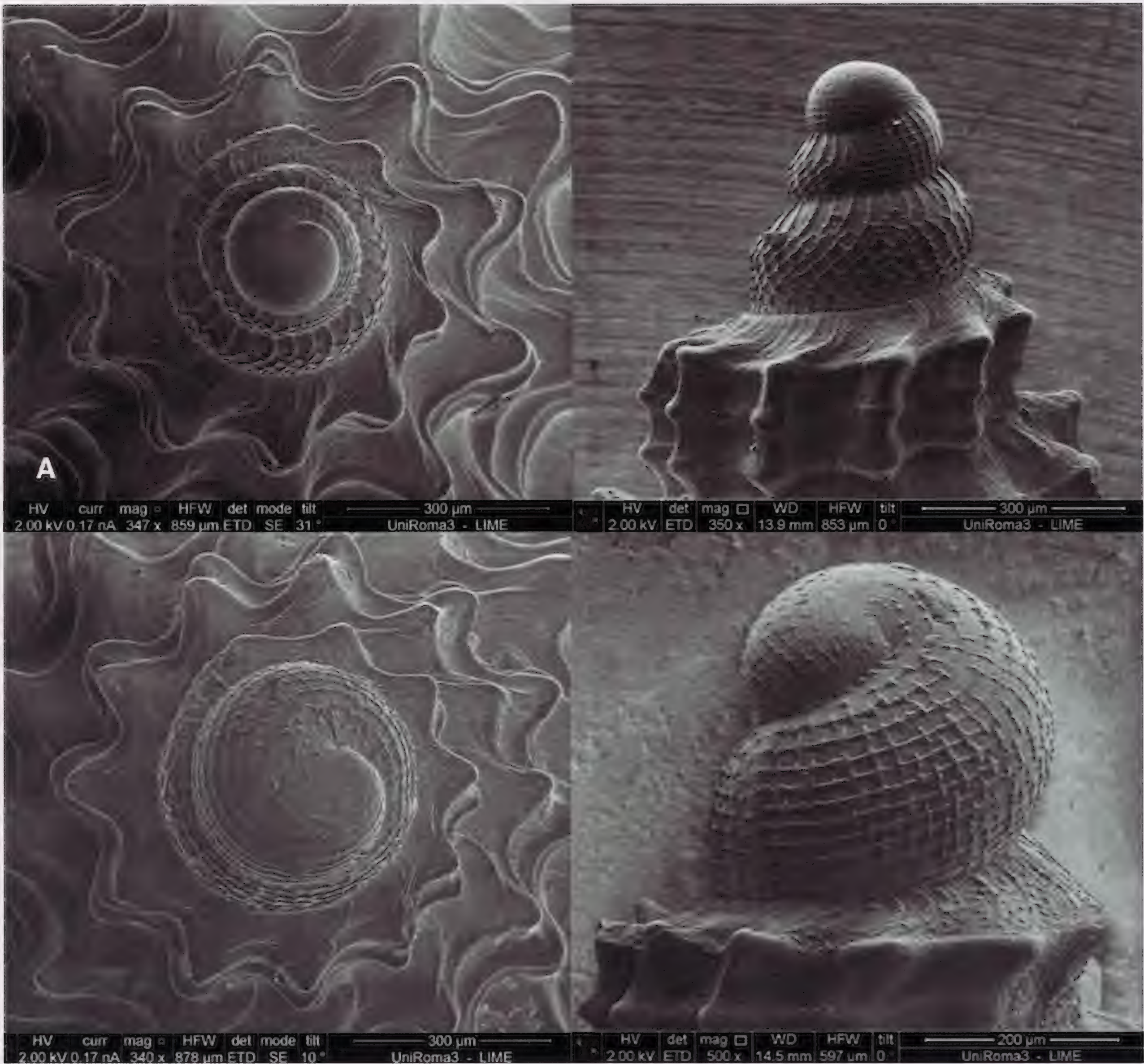


Fig. 31. A. *Raphitoma bicolor* (Risso, 1826), protoconch; B. *Raphitoma farolita* Nordsieck, 1977, protoconch.

Fig. 31. A. *Raphitoma bicolor* (Risso, 1826), protoconca; B. *Raphitoma farolita* Nordsieck, 1977, protoconca.

conch, this species was described by Nordsieck (1977) as *R. (Ph.) servaini farolita* (see below).

***Raphitoma farolita* Nordsieck, 1977  
(Figs 30, 31B)**

= *R. (Ph.) servaini farolita* Nordsieck, 1977: 5 8, pl. 18, fig. 147 (figures 146 and 147 appear to be reversed by mistake)  
= *Raphitoma* aff. *bicolor* Romani et al., 2017: 37, figs 8A, 8

**Type material**

(*Ph.*) *servaini farolita* Nordsieck – Thirteen shells in 3 vials, SMF Frankfurt: Holotype (h: 7 mm, width: 3.2 mm) with handwritten label “Philb. servaini farolita n. ssp/Ibiza” and subsequent curatorial label “Philbertia servaini farolita F.N./holotypus?” and 11 paratypes, Ibiza (Spain; 10 lacking protoconch and 1 with multispiral protoconch); 3) 1 paratype, Brindisi (Italy; protoconch missing).

**Type locality**

Ibiza.

**Material examined**

The type material and:  
Corsica – Bastia, 1 sh *sub nomine Philbertia bucquoyi* (Monterosato, MCZR-M-16675).  
Sardinia – Oristano, 2 sh (RUF). S’Archittu, 1 sh (SOS).  
Sicily – Isola delle Femmine, 1 sh (PUS); Ustica Is., Punta Gavazzi, 1 sh (AGA); Cannizzaro, 11 sh (BAR), 3 sh (PAO), 1 sh (PAG); Ognina, 1 sh (GER); Siracusa, 4 sh (AGA), 2 sh (PUS); Vendicari, 1 sh (PAG); Porto Palo (Siracusa), 1 sh (GER); Capo Passero, 2 sh (RUF); Capo Tramontana (S. Vito Lo Capo - TP), 1 sh (ARD).  
Italy – Giannutri Is., 2 sh (BAR); Secche della Meloria, 1 sh (DIN); Livorno, 3 sh (PAO); Castiglioncello, 1 sh (PAO); Vada, 1 sh (PAG); Montalto di Castro, 1 sh





**Fig. 32.** *Raphitoma skylla* sp. nov. **A.** holotype, Scilla (MNHN), h: mm 7.5; **B.** Scilla, h: 7.7 mm; **C.** Scilla, h: 8.5; **D.** Scilla, h: mm 7.4; **E.** paratype D (CFP); Scilla, h: 6 mm; **F.** Scilla, h: 7.7 mm; **G.** Scilla, h: 7.6 mm.

**Fig. 32.** *Raphitoma skylla* sp. nov. **A.** olotipo, Scilla (MNHN), h: mm 7,5; **B.** Scilla, h: 7,7 mm; **C.** Scilla, h: 8,5; **D.** Scilla, h: mm 7,4; **E.** paratipo D (CFP); Scilla, h: 6 mm; **F.** Scilla, h: 7,7 mm; **G.** Scilla, h: 7,6 mm.



(OCC); Santa Marinella, 1 sh (RUF), 1 sh (PUS); Capo Linaro, 1 sh (ARD); Macchia Tonda shoals, 1 sh (PAG); Bagnara, 1 sh (RAV); Scilla, 17 sh (VAZ); 2 sh (PAO); Campomarino, 1 sh (REN).  
Malta – St. Paul Bay, 1 sh (CHI).  
Croatia – Veli Rat, 4 sh (PUS).  
Turkey – Bozcaada, 1 sh (PUS).  
Egypt – Alexandria, 2 sh (coll Melvill-Tomlin NMW 1955.158.25151).

## Distribution

The entire Mediterranean Sea.

## Description [in square brackets the data of the holotype]

**Shell** ovato-pupoid, of **medium size for the genus**, height: 6-9 mm [7], width: 3-3.4 mm [3.2]. H/W: 2.15-2.24 [mean: 2.19] DS: 0,19 [2.18].

**Protoconch paucispiral (Fig. 31B)**, only protoconch I of 1.5 convex whorls, height: 360 µm, width: 416 µm; sculpture irregularly cancellate.

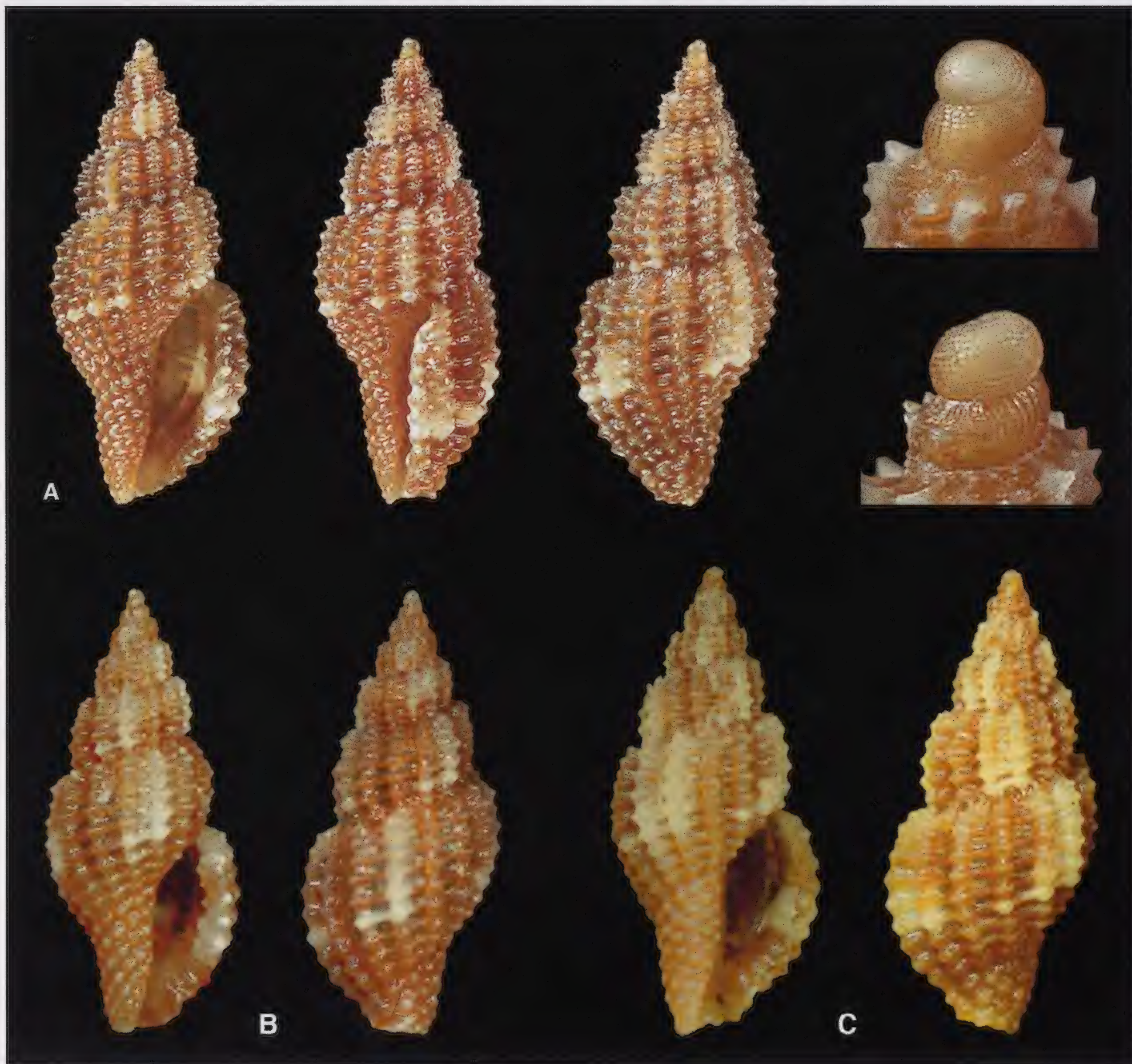
**Protoconch-teleoconch boundary** slightly indistinct but flexuose.

**Teleoconch** of 5-6 [6] convex whorls, stout, suture incised, sculpture robust. Scattered microgranules on the surface on the first whorl of the teleoconch including the ramp. **Axial sculpture** of 13-18 [14] orthocline or rarely opisthocline, equidistant, robust ribs, and interspaces as wide as twice the ribs.

**Spiral sculpture** on the last whorl of 6-7 [5] cordlets above the aperture, narrower than the axials. Cancellation rectangular, with strong and slightly elongated tubercles at the intersections.

**Subsutural** ramp narrow, with small tubercles in correspondence with the axial ribs tip, sometimes one or two smaller cordlets on the ramp.

**Columella** simple, slightly sinuous anteriorly, gently angled posteriorly.



**Fig. 33.** *Raphitoma kharybdis* n. sp. **A.** holotype, Scilla (MNHN, h: 8.4 mm); **B.** paratype C. Scilla (MPRC, h: 6.7 mm); **C.** Scilla (h: 7.2 mm).

**Fig. 33.** *Raphitoma kharybdis* n. sp.. **A.** olotipo, Scilla (MNHN, h: 8,4 mm); **B.** paratipo C. Scilla (MPRC, h: 6,7 mm); **C.** Scilla (h: 7,2 mm).



**Outer lip** with 8-11 elongated inner denticles [9], the most anterior more robust and delimiting the short siphonal canal, the most posterior delimiting the shallow anal sinus.

**Siphonal fasciole** with 7-8 nodulose cords.

**Colour** uniformly light tawny (common) to brown (rare) the background, with large whitish blotches, sometimes very faint. Suprasutural cordlet same colour as the blotches, at least on the last whorl.

**Soft parts** unknown.

## Remarks

Rarely attaining 9 mm or more. The holotype (beached) is decolored, yet with the suprasutural whitish cord still evident.

As shown, *Clathurella servaini* Locard, 1891, was based on severely eroded specimens, yet the two specimens from St. Malò (among which the lectotype, see Fig. 23B) show it is a synonym of *R. oblonga* Jeffreys, 1867 (Fig. 22-23).

*R. farolita* has nothing to do with *R. oblonga* Jeffreys, and is instead almost identical to *R. bicolor*, from which it can be diagnosed by the paucispiral (*vs.* multispiral) protoconch, and by being relatively smaller. Among the other *Raphitoma* with paucispiral protoconchs, *R. farolita* differs from *R. philberti* (Fig. 44) by its stouter outline ( $H/W < 2.19$  *vs.*  $> 2.4$  in *R. philberti*), by its stronger sculpture, and the whitish blotches not hued posteriorly; from *R. alternans* (Fig. 46) it is diagnosed by its vivid white spots, the thicker and not fragile shell, and the fewer inner lip denticles (8-11 *v.*  $> 11$  in *R. alternans*); from *R. bartolinorum* n. sp. (Fig. 38) it differs by its stronger sculpture, and the presence of white blotches.

*Raphitoma skylla* Pusateri & Giannuzzi-Savelli n. sp.  
(Figs 32, 34A)

## Type material

Holotype mm 7.7 x 3.6 and paratype A mm 7.9 x 3.4 (MNHN), paratype B mm 6.8 x 3 (MCZR), paratype C mm 8.8 x 4 (MPRC), paratype D mm 6 x 3 (CFP), paratype E mm 3.3 x 1.8 (SMR), all from type locality (leg. A. Vazzana).

## Type locality

Rupe di Scilla, 38°15'23"N, 15°42'47"E, - 40/50 m.

## Material examined

The type material and:

**Sicily** – Messina, 1 sh (PUS); Cannizzaro (Catania), 3 sh (BOG); Ognina (Catania), 1 sh (GER); Brucoli (Siracusa), 3 sh (PUS); Siracusa, 2 sh (PUS).

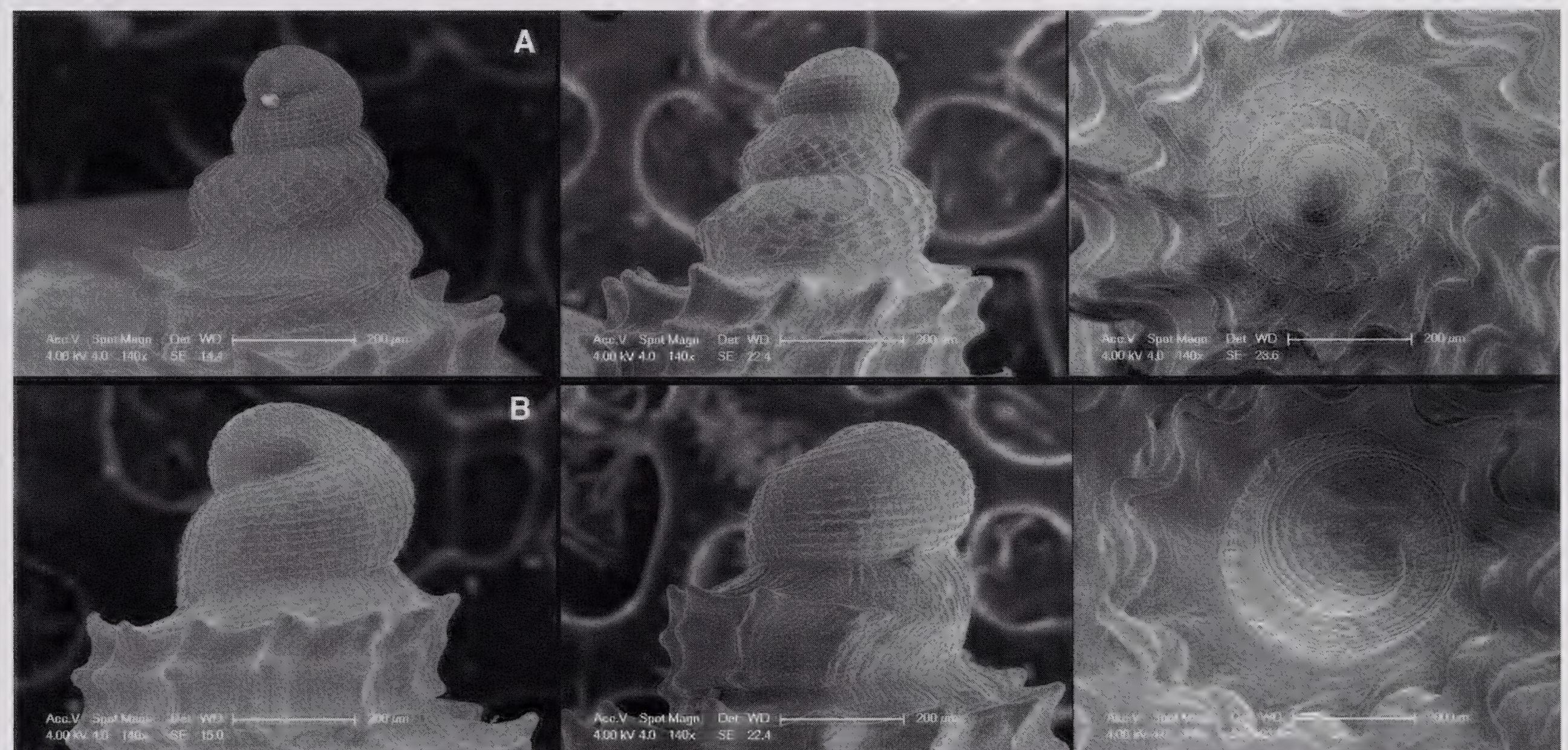
**Italy** – Elba Is. 25, 1 sh (BOG); Cala Mortola (Capraia Is.) 10, 1 sh (BOG); Castiglione, 1 sh (PAG), 1 sh (BOG); 1 sh (PAD); Montalto Marina (Viterbo), 3 sh (OCC); Punta Pioppeto (Procida Is.), 1 sh (PUS); Sorrento (Napoli), 1 sh (DUR); Isola Santo Janni, 2 sh 24 m (CAR); Cetraro (Cosenza), 3 sh (RON); Scilla (Reggio Calabria), 17 sh + 13 juv (VAZ).

## Distribuzione

Known so far only on the examined material, from the central-southern Tyrrhenian Sea and the Jonian coast of Sicily.

## Description [in square brackets the data of the holotype]

**Shell** slender subpupoid, of **medium size for the genus**, height: 6-9 mm, mean: 7.39 DS: 0.82 [7.6], rarely exceed-



**Fig. 34. A.** *Raphitoma skylla* sp. nov., protoconch; **B.** *Raphitoma kharybdis* n. sp., protoconch.

**Fig. 34. A.** *Raphitoma skylla* sp. nov., protoconca; **B.** *Raphitoma kharybdis* n. sp., protoconca.



ing 8 mm, width: 3-4.2 mm, mean: 3.35 DS: 0.29 [3.6]. H/W: 2.00-2.36, mean: 2.19, DS: 0.12 [2.32].

**Protoconch multispiral (Fig. 34A)** of 2.7 convex whorls, height: 489 µm, width: 428 µm, protoconch I of 1 whorls, width: 136 µm, covered by thin cancellations, protoconch II with a diagonally cancellate sculpture starting after a wide zone under the suture with fine curved axial threads. The last whorl with short and weak keel before the onset of the teleoconch. **Protoconch-teleoconch boundary** strongly flexuose, opisthocline.

**Teleoconch** of 5-6 [5] convex whorls, stout, suture incised, sculpture robust. No microgranules on the surface. **Axial sculpture** of 13-16 [13] orthocline, equidistant ribs, and interspaces 1.5 times as wide as the ribs.

**Spiral sculpture** above the aperture of 5-6 [5] cords above the aperture, narrower than the axials. Cancellation rectangular, with strong and slightly elongated tubercles at the intersections. Tubercles spinulose in juveniles.

**Subsutural** ramp very narrow, with small tubercles in correspondence with the axial ribs tip. White comma-shaped spots can be present.

**Columella** simple, slightly sinuous at half length, gently angled posteriorly.

**Outer lip** with 8-9 [8] strong inner denticles, the most anterior more robust and delimiting the short siphonal canal, the most posterior delimiting the deep anal sinus.

**Siphonal fasciole** with 7-8 strong nodulose cords.

**Colour** uniformly chestnut brown in the background, with large whitish blotches, as wide as 2 (rarely 3) axial ribs. Suprasutural cordlet whitish, delimiting the area of the white blotches.

**Soft parts** unknown.

### *Derivatio nominis*

From the mythological six-headed monster Skylla (Greek: Σκύλλα), purportedly living on a rock on the peninsular side of the Messina Strait where the modern city of Scilla has been erected. Used as a noun in apposition.

### Remarks

*Raphitoma skylla* n. sp. differs from *R. bicolor* (Fig. 27) (with which it is found sympatric) by attaining a smaller adult size (max 9 mm *vs.* >12 mm of *R. bicolor*), by the longer protoconch (3.75 whorls *vs.* 3 in *R. bicolor*). On the protoconch, the subsutural axial threads of *R. skylla* are fewer and more spaced, and the rows of lozenges are 2.5 file *vs.* 3.5 in *R. bicolor* (Fig. 31A). Other characters are not fully diagnostic, thus making it difficult to identify specimens without the protoconch and/or juveniles. For instance, the white blotches extend over maximum two axials in *R. skylla* whilst they cover minimum two axials in *R. bicolor* with some specimens almost entirely white (see Figs 27-29, 31A).

*Raphitoma skylla* n. sp. differs from *R. locardi* Pusateri & Giannuzzi-Savelli, 2013 by its less slender and cylindrical outline (H/W 2.19 *vs.* 2.45 in *R. locardi*). Furthermore, the white blotches tend to hue anteriorly, whilst they

are neatly bordered by the spiral white cordlet in *R. skylla*. (see Fig. 40).

*R. densa* Monterosato, 1884 differs from *R. skylla* by its more slender outline and the ash-grey blotches (*vs.* white in *R. skylla*). (see Fig. 59B)

*R. laviae*, has a comparable adult size, but differs in the more slender outline, the less impressed suture, the denser sculpture, the more variable colour pattern. (see Fig. 35)

*R. skylla* has been collected sympatrically with its sister with paucispiral protoconch, *Raphitoma kharybdis* n. sp.

### *Raphitoma kharybdis*

Pusateri & Giannuzzi-Savelli n. sp.

(Figs 33, 34B)

### Type material

Holotype mm 8.4 x 3.6 and paratype A mm 5.8 x 2.7 (MNHN); paratype B mm 7.6 x 3.5 (MCZR); paratype C mm 6.7 x 3.2 (MPRC, Museo Paleomarino Reggio Calabria); paratype D mm 7.7 x 3.6 (CFP), paratype E mm 4.4 x 2.2 (SMR), all from type locality (leg. A. Vazzana).

### Type locality

Rupe di Scilla, 38°15'23"N, 15°42'47"E, - 40/50 m.

### Material examined

The type material and:

Italy – Marina di Montalto, 1 sh (OCC), Sapri, 2 sh juv. (RON); Scilla, 1 sh (RON), 15 sh (VAZ), 2 sh (PUS).

Sicily – Ognina (Siracusa), 1 sh (GER); Porto Palo (Siracusa), 1 sh (GER).

### Distribution

Known so far only on the examined material, from the central-southern Tyrrhenian Sea and the Jonian coast of Sicily.

### Description [in square brackets the data of the holotype]

**Shell of medium size for the genus**, height: 6-8.6 mm, mean: 7.29 DS: 0.75 [8.3], width: 2.7-3.7 mean: 3.35 DS: 0.29 [3.6]. Slender subpupoid, H/W: 1.91-2.32, mean: 2.17, DS: 0.10 [2.31].

**Protoconch paucispiral (Fig. 34B)**, only protoconch I of 1.4 convex whorls, height: 440 µm, width: 390 µm; sculpture irregularly cancellate.

**Protoconch-teleoconch boundary** slightly indistinct but flexuose. Scattered microgranules at the end of the protoconch.

**Teleoconch** of 5-6 [6] convex whorls, stout, suture incised, sculpture robust. No microgranules on the surface. **Axial sculpture** of 14-15 [15] (exceptionally 13) orthocline or rarely opisthocline, equidistant, robust ribs, and interspaces as wide as 1.5 times the ribs.

**Spiral sculpture** above the aperture of 5-6 [6] cordlets

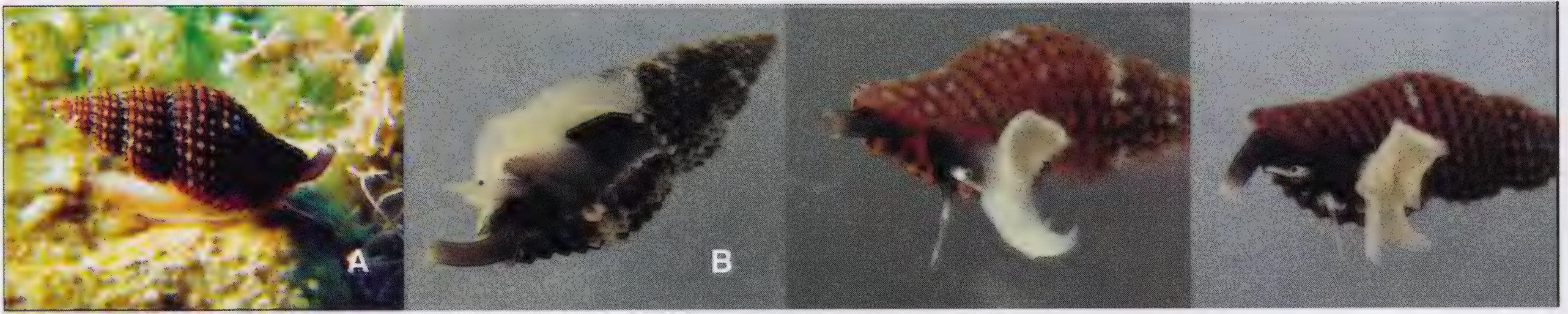




**Fig. 35.** *Raphitoma laviae* (Philippi, 1844). **A.** Philippi's original drawing; **B.** neotype (MNHN), Cannizzaro (Catania) 37° 32' Lat N - 15° 8' Long E (- 26 m), h: mm 5.9 x 2.7; **C.** Genova, h: 9.0 mm; **D.** Isola delle Femmine (Palermo), h: 6.5 mm; **E.** Genova, h: 5.9 mm; **F.** Ficarazzi (Palermo), h: 9.2 mm; **G.** San Vito Lo Capo (Trapani), h: 5.6 mm; **H.** Tuscany Archipelago, h: 1.5 mm; **I.** Sferracavallo (Palermo), h: 8.1 mm; **L.** Porto Conte (Sassari); h: 6.2 mm.

**Fig. 35.** *Raphitoma laviae* (Philippi, 1844). **A.** Disegno originale di Philippi; **B.** neotipo (MNHN), Cannizzaro (Catania) 37° 32' Lat N - 15° 8' Long E (- 26 m), h: mm 5,9 x 2,7; **C.** Genova, h: 9,0 mm; **D.** Isola delle Femmine (Palermo), h: 6,5 mm; **E.** Genova, h: 5,9 mm; **F.** Ficarazzi (Palermo), h: 9,2 mm; **G.** San Vito Lo Capo (Trapani), h: 5,6 mm; **H.** Arcipelago Toscano, h: 1,5 mm; **I.** Sferracavallo (Palermo), h: 8,1 mm; **L.** Porto Conte (Sassari); h: 6,2 mm.





**Fig. 36.** *Raphitoma laviae* (Philippi, 1844). Living animals, **A.** photo courtesy by D. Horst, **B.** photo courtesy by J. Prkić and A. Munter.

**Fig. 36.** *Raphitoma laviae* (Philippi, 1844). animali viventi, **A.** foto di D. Horst, **B.** foto di J. Prkić e A. Munter.

above the aperture, narrower than the axials. Cancellation rectangular, with strong and slightly elongated tubercles at the intersections.

**Subsutural** ramp narrow, with small tubercles in correspondence with the axial ribs tip.

**Columella** simple, slightly sinuous at half length, gently angled posteriorly.

**Outer lip** with 9 (rarely 8) elongated inner denticles, the most anterior more robust and delimiting the short siphonal canal, the most posterior delimiting the deep anal sinus.

**Siphonal fasciole** with 8 nodulose cords.

**Colour** uniformly burnt umber the background, with white blotches, as wide as 1 (rarely 2) axial ribs. Supra-sutural cordlet whitish, delimiting the area of the white blotches.

**Soft parts** unknown.

### *Derivatio nominis*

From the mythological sea monster *Kharybdis* (Greek: Χάρυβδις), purportedly living in the waters of the Messina Strait where he created whirlpools to swallow ships.

### Remarks

*Raphitoma kharybdis* n. sp. has been collected sympatrically with *R. farolita* (**Fig. 30**) from which differ for the smaller protoconch diameter (390 µm *vs.* 416 µm), the less marked keel on the protoconch, the small cordlet on the subsutural ramp on early teleoconch whorls, the proportionally smaller white blotches.

*Raphitoma kharybdis* may be confused with small and atypically coloured specimens of *R. philberti*, but can be diagnosed by its more cyrtconoid outline, the stronger sculpture, and an usually lower H/W (1.91-2.32 *vs.* 2.21-2.81). (see **Figs 43-44**).

*Raphitoma kharybdis* differs from *R. alternans* (**Fig. 46**) by its stronger sculpture and more solid aspect, the proportionally smaller white blotches, and its higher H/W (1.91-2.32 *kharybdis vs.* > 2.5 *alternans*).

*Raphitoma kharybdis* differs from *R. bartolinorum* by the distinct protoconch sculpture and the different colour pattern (*bartolinorum* has a cord totally or partly white, and the rest is monochrome, see **Fig. 38**).

*Raphitoma laviae* (Philippi, 1844)  
(**Figs 35-36, 39A**)

*Pleurotoma laviae* Philippi, 1844, En. Moll. Sic. 2:170; pl. XXVI fig. 17

*Raphitoma laviae*, Brusina, 1866: 64

*Defrancia laviae* Weinkauff, 1868: 133 sp. 5

*Pleurotoma (Defrancia) laviae* Petit de la Saussaye, 1869: 154

*Defrancia laviae* Appellius, 1869: 138

*Pleurotoma laviae* Monterosato, 1872: 51

*Pleurotoma laviae* Monterosato, 1875: 44

*Pleurotoma laviae* Aradas & Benoit, 1876: 250 n. 664

*Pleurotoma laviae* Monterosato, 1878: 106

*Pleurotoma laviae* Monterosato, 1880: 229

*Raphitoma laviae* Stossich, 1880: 83

*Clathurella purpurea* var. *laviae* B.D.D., 1883: 91, pl. 14 n. 18-19

*Clathurella purpurea* var. *laviae* Tryon, 1884: 275

*Philbertia laviae* Monterosato, 1884: 133

*Clathurella laviae* Locard, 1886: 113

*Clathurella (Cordieria) laviae* Carus, 1889: 425

*Clathurella laviae* Locard, 1891: 65

*Clathurella laviae* Locard and Caziot, 1900: 247

*Clathurella laviae* var. *atra* Locard and Caziot, 1900: 247, *nomen nudum*

*Clathurella laviae* var. *bicolor* Locard and Caziot, 1900: 247, *nomen nudum*

*Clathurella laviae* var. *elongata* Locard and Caziot, 1900: 247, *nomen nudum*

*Clathurella laviae* var. *fusca* Locard and Caziot, 1900: 247, *nomen nudum*

*Clathurella laviae* var. *minor* Locard and Caziot, 1900: 247, *nomen nudum*

*Clathurella laviae* var. *ventricosa* Locard and Caziot, 1900: 247, *nomen nudum*

*Raphitoma laviae* Pallary, 1900: 256

*Clathurella laviae* Hidalgo, 1917: 249

*Philbertia laviae* Bellini, 1929: 31

*Philbertia bicolor* var. *laviae* Pallary, 1938: 16

*Philbertia (Philbertia) la Viae* [sic!] Priolo, 1967: 694

*Raphitoma (Philbertia) laviae* Nordsieck, 1968: 177, pl. 30 fig. 94.37

*Raphitoma laviae*, Parenzan, 1970: 208, pl. 44, fig. 844

*Raphitoma laviae* Ghisotti, 1972: 85

*Philbertia laviae* Spada, Sabelli & Morandi, 1973: 55, pl. 4 fig. 8

*Raphitoma fallax* sensu Nordsieck, 1977 non (Forbes, 1843): 58, pl. 19 fig. 151

*Raphitoma (Philbertia) laviae* Nordsieck, 1977: 58, pl. 19 fig. 148

*Raphitoma (Philbertia) laviae* Piani, 1980: 157

*Raphitoma laviae* Bogi, Coppini & Margelli, 1980 (134-135): 18 fig. 12

*Raphitoma laviae* (Philippi, 1844), Luque & Templado, 1981: 27

*Clathurella laviae* (Philippi, 1844), Templado & Llanso, 1981: 36, 37

*Raphitoma laviae* Terreni, 1981: 41

*Raphitoma laviae* Van Aartsen, Menkhurst & Gittenberger, 1984: 90, 91



- Raphitoma laviae* Orlando & Palazzi, 1985: 44  
*Raphitoma laviae* Sabelli, Giannuzzi-Savelli & Bedulli, 1990-92: 44, 411  
*Raphitoma laviae* Mifsud, 1993: 6, fig. p. 9  
*Raphitoma* (*Raphitoma*) cf. *laviae*, Cachia, Mifsud & Sammut, 1993: 34  
*Clathurella laviae* Fernandes & Rolan, 1993: 39  
*Raphitoma laviae* Delamotte, & Vardala-Theodorou, 1994: 287  
*Raphitoma laviae* Delamotte, & Vardala-Theodorou, 2001: 137 fig. 11  
*Raphitoma laviae* Martini, Gillone, Lombardi & Sabelli, 2001: 191  
*Raphitoma laviae* Cachia, Mifsud & Sammut, 2001: 67, pl. 10 fig. 4 (doubtful identification)  
*Raphitoma purpurea* sensu Cachia, Mifsud & Sammut, 2001: 70, pl. 10 fig. 10  
*Raphitoma laviae* Oztürk, 2001: 55  
*Raphitoma laviae* Oztürk, Buzzurro & Benli, 2004: 59  
*Raphitoma laviae* Repetto, Orlando & Arduino, 2005: 218, fig. 899  
*Raphitoma laviae* Doneddu & Trainito, 2005: 149, fig. 360 (doubtful identification)  
*Raphitoma laviae* Trono, 2006: 68  
*Raphitoma laviae* Kabasakal, Karhan, & Kabasakal, 2006: 67 fig. 10 (see remarks)  
*Raphitoma laviae* Mazziotti, Agamennone & Tisselli, 2008: 78  
*Raphitoma laviae* Cecalupo, Buzzurro & Mariani, 2008: 32, (see remarks)  
*Raphitoma laviae* Repetto, Bianco & Ciccimarra, 2011: 41, 195  
*Raphitoma laviae* Cossignani & Ardovini, 2011: 326  
*Raphitoma laviae* Manousis, 2012: 179 (Figured)  
*Raphitoma laviae* Manousis et al., 2018: 13 figd. 13a-f

## Type material

*Pleurotoma laviae* Philippi - Neotype MNHN, Paris, H: 5.9 mm; D: 2.7 (legit et donavit A. Germanà).

## Type locality

Cannizzaro (Catania) 37° 32' 28"N 15° 08' 12"E.



**Fig. 37.** **A.** *Raphitoma atropurpurea* (Locard & Caziot, 1899), Napoli, h: 8 mm; **B.** *R. (Philbertia) fallax* sensu Nordsieck, 1977 non Forbes, 1843, Brindisi, h: 6.2 mm (SMF n. 337096); **C.** *R. lineolata* (B.D.D., 1883), Saronikos Gulf (Greece), h: 5 mm (photo courtesy by Costas Kontadakis).

**Fig. 37.** **A.** *Raphitoma atropurpurea* (Locard & Caziot, 1899), Napoli, h: 8 mm; **B.** *R. (Philbertia) fallax* sensu Nordsieck, 1977 non Forbes, 1843, Brindisi, h: 6.2 mm (SMF n. 337096); **C.** *R. lineolata* (B.D.D., 1883), Golfo di Saronikos (Grecia), h: 5 mm (foto di Costas Kontadakis).

## Material examined

The type material and:

**Spain** – La Herradura, 1 sh (AGA), 1 sh (COP); El Calo - Formentera Is. (Balears), 1 sh (SMNH lot 73166A); Punta de la Mona (Malaga), 7 sh (BAR); Cadaqués (Costa Brava), 3 sh (BAR).

**Corsica** – 5 sh (coll. Locard, MNHN – *sub nomine Clathurella purpurea*), 6 sh (coll. Nelva, MNHN); Calvi (Corsica), 1 sh (coll. SMNH lot 73171C, legit A. Warén); Ajaccio, 3 sh (CRO); Bastia, 1 sh (MCZR-M-16806); Ile Rousse, 1 sh (MNHN); Iles Cerbicale, 2 sh (SMR).

**France** – Roussillon, 4 sh (MCZR-M-16806); Marsiglia, 2 sh (coll. Couturier, MNHN); “Coste di Provenza”, 1 sh (MCZR-M-16806); Cannes, 2 sh (coll. Schlesch, SMNH lot 73084B legit Pässler); Iles Embiez (Provence), 2 sh (MNHN); Ile Verte (Provence), 1 sh (PUS); Saint Maxime (Var), 1 sh (HOA); St. Raphael, 6 sh (MCZR-M-16806).

**Sardinia** – Alghero, 1 sh (MAR); unprecised locality, 1 sh (OCC); Olbia, 1 sh (CRO), S. Teresa di Gallura (Sassari), 1 sh (DON); La Maddalena Is., 1 sh (MTS); Grotte di Portocoste, 5 sh (OLI); Sant’Antioco (Carbonia), 2 sh (RUF); Tres Nuraghes (Oristano), 5 sh (PAL); Golfo Aranci, 3 sh (NOF); S’Archittu, Oristano, > 40 sh (SOS); Stintino (Sassari), 1 sh (NOF); Oristano, 5 sh (PUS), Cagliari, 3 sh (PIS).  
**Sicily** – Lampedusa Is., 2 sh (MAR); Punta Cappellone, Lampedusa, 1 sh (CRO); Trapani, 1 sh (PAG), 1 sh (PAD); Palermo, 21 sh (coll. Coen, HUI, lot 1912A); Spiaggia Levante (Milazzo, Messina), 1 sh (NOT); Bruccoli, 3 sh (coll. SMNH lots 73206G, 73098), 4 sh (CRO); Taormina, 1 sh (VIL); Acicastello, 4 sh (CRO); Acitrezza (Catania), 13 sh (SMNH lot 73097A), 7 sh (CRO); Cannizzaro (Catania), 5 sh (BAR), 17 sh (GER), 2 sh (PAG); Catania, 1 sh (MCZR-M-16806); Catania (Lido Bellatrix), 1 sh (RAV); Pozzillo Inferiore (Catania), 2 sh (PAG); Siracusa, (coll. Nordsieck SMF, lotto n. 337095 *sub nomine R. fallax*); Porto Palo, (Siracusa), 1 sh (GER); Trapani, 3 sh (SER); S. Giuliano (Trapani), 1 sh (PAL); S. Vito Lo Capo (Trapani), 2 sh (BAR); Isola delle Femmine, 16 sh (PUS), 1 sh (SER); Lo Scalone, Messina, > 10 sh (BAR); Porticello (Palermo), 2 sh (GIR); Cinisi (Palermo), 1 sh (MRSNT n. 2996/9782, *sub nomine R. reticulata*); Carini (Palermo), 2 sh (PAL); Sferracavallo (Palermo), 1 sh (coll. MRSNT n. 45330, 1 sh *sub nomine R. purpurea*).

**Italy** – Riva Trigoso (Genova), 25 sh (SOS), 5 sh 20 m (REP); Bargeggi (Savona), 3 sh (SOS); Genova, 9 sh (PUS); La Spezia, 1 sh (MCZR-M-16806); Castiglione (Livorno), 14 sh (MAR); Scogli dell’Accademia (Livorno), 1 sh (MAR); Punta Ala (Grosseto), 1 sh (MAR), 1 sh (COP); Grosseto 2 sh 5 m (REP); Golfo di Baratti, 2 sh (NOF), 4 sh 20 m (PAO); Elba Isl, 5 sh (BAR); Calafuria (Livorno), 4 sh (BAR), 4 sh (RAV); Laconella, Elba 6 m, 1 sh (CRO); Enfolia, Is. d’Elba, 1 sh (PAO); Capraia Isl, 8 sh (PAG), 5 sh (PAD); S. Felice Circeo (Latina), 2 sh (BIN); S. Agostino (Roma), 1 sh (PAL); Formia (Latina), 1 sh (TRI); Napoli, 1 sh (MCZR-M-16806); Capri Is., 3 sh (CRO), 1 sh (BOG); Anacapri (Capri Is.), 1 sh (BOG); Procida Is., 3 sh (DUR), 23 sh (CRO); Sorrento, 1 sh (DUR); Napoli, 1 sh (DUR); Punta Pioppeto, 1 sh (DUR), 6 m, 13 sh (CRO); Sapri, 2 sh (RON); Puolo, 1 sh (RUF),



2 sh (DUR); Scilla (Reggio Calabria), 1 sh (PUS), 1 sh (PAG), 10 sh 40 m (PAO), > 30 sh 40 m (VAZ), 1 sh (RON), 3 sh (CRO); Costa Viola, 1 sh (PAO), 1 sh (RAV). Gallipoli (Lecce), 3 sh (PAL); Castro Marina (Lecce), 1 sh (TRO); Porto Cesareo (Taranto), 2 sh (NOF); Santa Caterina (Lecce), 2 sh (TRO); Santa Maria al Bagno – Grotta Madonnina (Lecce), 4 sh (TRO); Otranto, 3 sh (MAC); Torre Serpe (Otranto), 1 sh (MAC); Marina di Ugento (Lecce), 7 sh (MAC); Gallipoli (Lecce), 1 sh (MAC); Campomarino (Taranto), 5 sh (DIN), 1 sh (MRSNT n. 23655), 2 sh (MON); Taranto, 2 sh (TRI); Brindisi, 2 sh (coll. Nordsieck, SMF lot 337096 *sub nomine P. fallax*); Monopoli, 2 sh (coll. Nordsieck SMF lot 337097 *sub nomine P. fallax*); Cala Rena, Giovinazzo, 2 sh (CRO), 4 sh (MEL); Civitanova Marche, 1 sh (CRO).

Malta – unprecised locality, 6 sh (MIF).

Croatia – Istrian Peninsula, 1 sh (PAG); Umag, 1 sh (BAL); unprecised locality, 2 sh (DEL); Krk Is., > 20 sh (BAR), 1 sh (PAG); Lošinj, 1 sh (PAG); Sukosan, 5 sh lv (PET), 5 sh (PRK); Biograd, 11 sh lv (PET), > 5 sh (PRK); Zaton, > 5 sh lv (PET); Split, > 10 sh lv (PRK); Murter Isl, 5 sh lv (PET); Sevid, 1 sh lv (PET), 1 sh lv (PRK).

Slovenija – Portoroz, 3 sh (REP); Savudrija (PAG, 1 sh).

Greece – Mallia, 4 sh (CRO); Achaia Patra, 2 sh (PAG); Georgopolis, Creta 6 m, 1 sh (CRO); Pefko, Skiros Is., 1 sh (CRO); Plataria, Igoumenitsa 6 m, 3 sh (CRO); Voula, Attika, 1 sh (CRO)

Turkey – Bozcaada Is. 8 m, 1 sh (STA).

Syrie – Saiida, 2 sh (MCZR-M-16806).

## Distribution

Known from the entire Mediterranean Sea, in shallow waters (0-5 m) where it is found under stones, amidst algae or *Posidonia* rhizomes.

## Description [in square brackets the data of the neotype]

**Shell** subfusiform of **small size for the genus**, height: 4.9-9 [5.9] mm mean: 6.86 (DS: 1.11), width: 2.2-4 [2.7] mm, mean: 2.97 DS: 0.44. H/W: 2.15-2.57, mean: 2.30, DS: 0.1 [5.9].

**Protoconch multispiral** (Fig. 39A) of 2.75 convex whorls, height: 550 µm, width: 395 µm, protoconch I of 1 whorls, width: 184 µm, covered by thin cancellations, protoconch II of 1.75 whorls, with a diagonally cancellate sculpture starting after a wide zone under the suture with fine slightly curved axial threadlets. Last whorl with short and weak keel before the onset of the teleoconch and two suprasutural spiral cancellate threadlets. **Protoconch-teleoconch boundary** strongly flexuose, opisthocline.

**Teleoconch** of 5-6 [6] slightly convex whorls, suture incised in the first whorls, sculpture robust. No microgranules on the surface. **Axial sculpture** of 16-23 [19] orthocline or slightly prosocline, strong ribs, and interspaces as wide as 1.5 times the ribs.

**Spiral sculpture** on the last whorl of 6-7 [6] cordlets (less thick than ribs) above the aperture. Cancellation

squared, with strong and slightly elongated pearl-shaped tubercles at the intersections.

**Subsutural** ramp very narrow, small tubercles in correspondence with the axial ribs tip and one or two small spiral cordlets.

**Columella** simple, slightly sinuous anteriorly, gently angled posteriorly.

**Outer lip** with 9 strong inner denticles, occasionally 8-10 [9], the most anterior delimiting the short siphonal canal, and the most posterior delimiting the shallow anal sinus, both wider and less elevated than the others.

**Siphonal fasciole** with 5-6 nodulose cords.

**Colour** from light yellow to dark brown, with all intermediates. Tubercles normally lighter than the background. Suprasutural cordlet often entirely whitish or white, or with white segments, and white tubercles. Occasional white-whitish blotches on dark-brown background shells. Rare white shells.

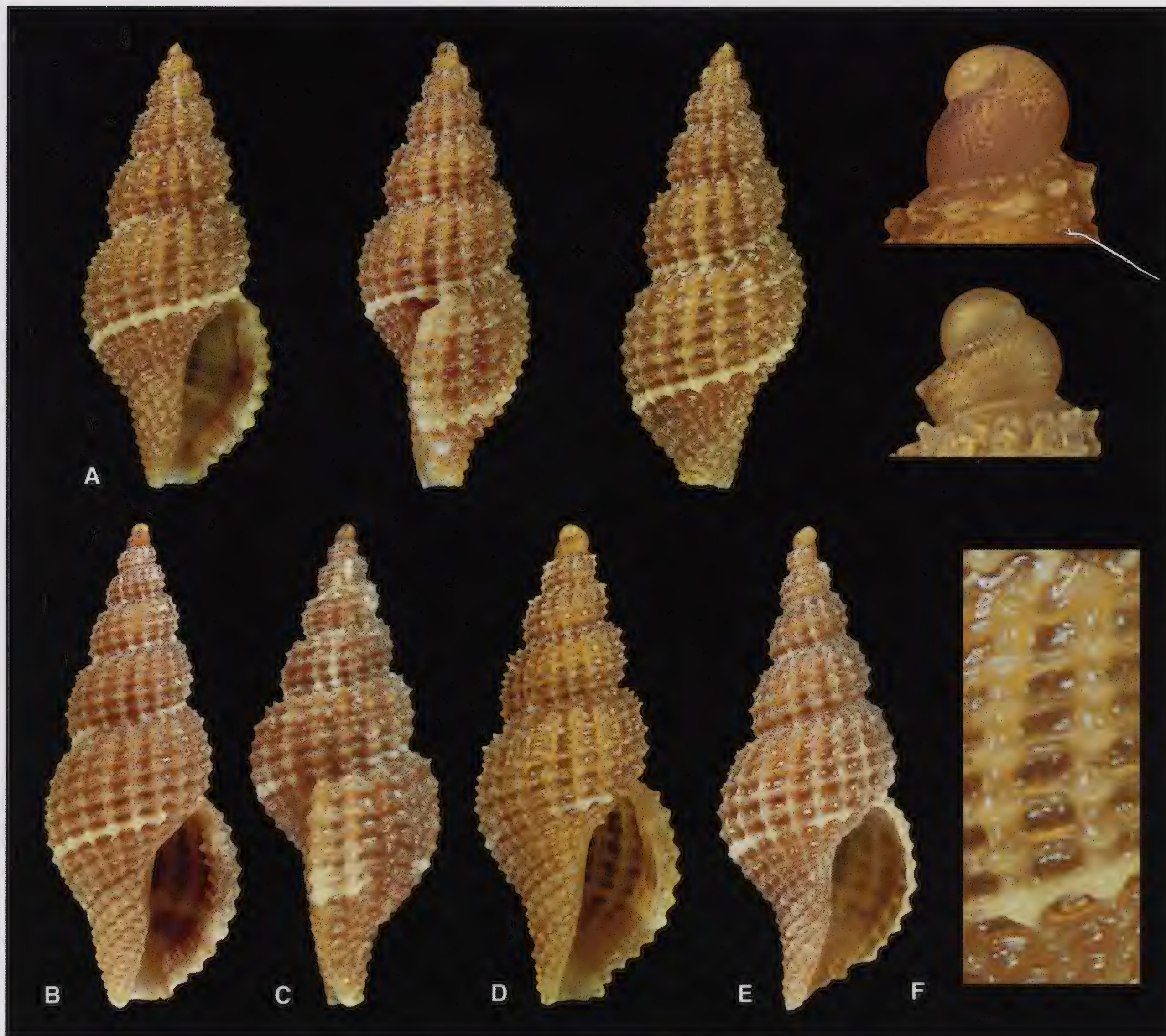
**Soft parts** foot bilobed anteriorly, with acute tips. Black eyes at proximal 1/3 of the tentacles. Foot and distal part of cephalic tentacle whitish hyaline semitransparent, with bright white speckles, head and base of tentacles dark grey-black, siphon dark grey covered with white speckles and an apical hyaline ring.

## Remarks

Certainly one of the smallest Mediterranean species of the genus. Philippi (1844: 170) described *Pleurotoma laviae* based on a single specimen but without explicitly citing a locality. However, the statement that it was collected along with *P. granum* (= *Clathromangelia granum*) allows to restrict the potential localities to Catania or Palermo (“Cataniae, Panormi”: Philippi, 1844: 199 *sub nomine P. rude*). The type specimen of this species has not been found at MNB (Christine Zorn pers. comm.) nor at MNHNC (Letelier Vallejos pers. comm.). Given the presence in the Mediterranean Sea of two species with very similar teleoconch, differing in their protoconch (multispiral *vs.* paucispiral) we selected a specimen with multispiral protoconch from Cannizzaro (Catania) and designated it as the neotype of *Pleurotoma laviae* Philippi, in order to stabilize the use of the name. *Raphitoma laviae* is easily identified also by its small size and the peculiar pearl-shaped tubercles. Monterosato (1872) considered it as a variety of *Raphitoma purpurea*, as also stated lateron (Monterosato, 1875: 44) where he also precised: “apice conico, stiliforme e con i giri angolati” [conical apex, styliform and with angled whorls]. Subsequently (Monterosato, 1878, 1880) considered it as a variety of *Raphitoma corbis* (also this dubitatively referred to *R. purpurea*). Finally (Monterosato, 1884), he raised to the rank of distinct species.

B.D.D. (1883: 91) seem to have held *tout court* Monterosato’s (1878) opinion, only to consider it closer to *Defrancia purpurea* var. *oblonga* Jeffreys, 1867 which is a distinct species (*R. oblonga*) completely unrelated to *R. laviae*. Spada et al. (1973: 55) reported the protoconch of *R. laviae* as paucispiral (2 whorls) whilst that of *R. bicolor* was reported as multispiral (3 whorls): they had inverted





**Fig. 38.** *Raphitoma bartolinorum* n.sp. **A.** holotype - (Catania) 37° 32' Lat N - 15° 8' Long E (40 m), mm 7.3 x 3.1 and protoconch by two sides, (MNHN); **B.** Cannizzaro (Catania), h: 8.5 mm; **C.** Cannizzaro (Catania), h: 8.4 mm; **D.** Cannizzaro (Catania), h: 5.4 mm; **E.** Cannizzaro (Catania), h: 6.6 mm; **F.** holotype: detail of sculpture.

**Fig. 38.** *Raphitoma bartolinorum* n.sp. **A.** olotipo, (Catania) 37° 32' Lat N - 15° 8' Long E (40 m), mm 7,3 x 3,1 e protoconca vista da due lati, (MNHN); **B.** Cannizzaro (Catania), h: 8,5 mm; **C.** Cannizzaro (Catania), h: 8,4 mm; **D.** Cannizzaro (Catania), h: 5,4 mm; **E.** Cannizzaro (Catania), h: 6,6 mm; **F.** olotipo, particolare della scultura.

their notations on the protoconchs of their samples (G. Spada pers. comm.), the protoconch of *R. laviae* thus (close to) three whorls, and the other species ("*R. bicolor*" with paucispiral protoconch) quite certainly *R. philberti*. Nordsieck (1977: 58) reported "*Philbertia fallax* Forbes, 1843" and figured Nordsieck (1977: pl. 19 fig. 151) a shell from Karpathos (SMF, lotto 337098/1), very worn and lacking the protoconch, which after examination proved to be referable to *R. laviae* due to its robust shell and pearl-shaped tubercles, notwithstanding Nordsieck's drawing does not match that shell. Other samples from Nordsieck collection under the name "*R. fallax*" (SMF, 337096/2 [Brindisi], 337095/1 [Siracusa], 337097/2 [Monopoli]) are all referable to *R. laviae*.

*Raphitoma laviae* as figured by (Kabasakal, Karhan, & Kabasakal, 2006: 67 fig. 10) is rather *R. contigua* (Monterosato, 1884). *R. laviae* as figured by (Cecalupo, Buzzurro & Mariani, 2008: 32) seems referable to a form of *R.*

*papillosa* (Pallary, 1904). *Raphitoma laviae* as figured by (Cachia, Mifsud & Sammut, 2001: 67, pl. 10 fig. 4) is not clearly identifiable, but certainly it is not *R. laviae*.

*R. laviae* can hardly be mixed with any other congener (except its sister, see below). Shells with the supra-sutural cordlet entirely white, could be confused with small specimens of *R. atropurpurea* Locard & Caziot, 1900, from which they can be diagnosed by the more numerous and closer ribs and the pearl-shaped tubercles (*vs.* more spaced and elevate ribs with elongated tubercles in *R. atropurpurea*). Specimens of *R. laviae*, with wide white blotches could be confused with small *R. bicolor* Risso, 1826 or *R. densa* Monterosato, 1884. *R. laviae* is more slender than *R. bicolor*; the blotches in *R. densa* are always ash-grey (never white), and it has more acute tubercles. *R. laviae* differs from small size specimens of *R. lineolata* by its pearl-shaped tubercles and the proportionally thinner spirals.



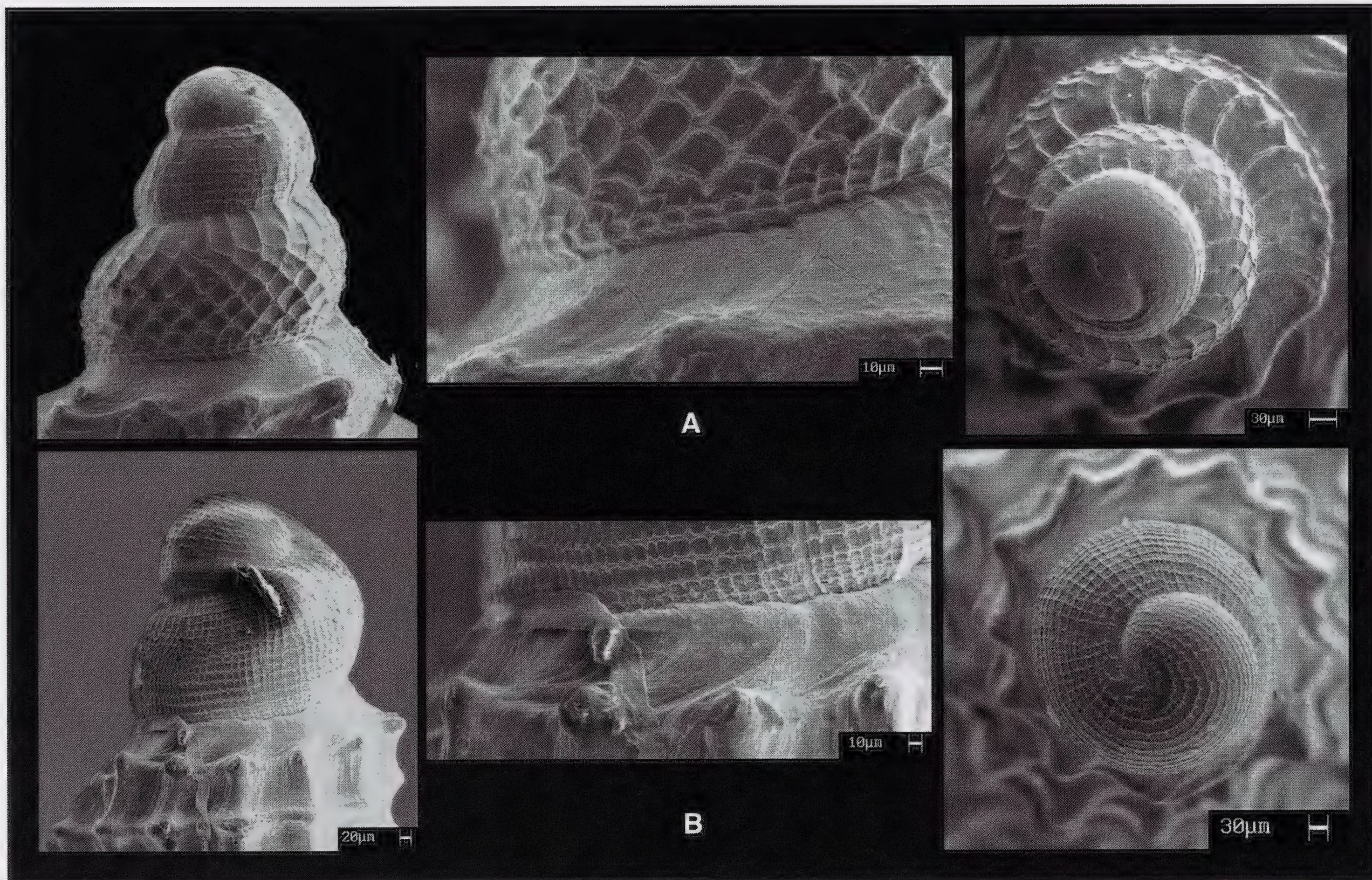


Fig. 39. A. *Raphitoma laviae* (Philippi, 1844), protoconch; B. *Raphitoma bartolinorum* n. sp., protoconch.

Fig. 39. A. *Raphitoma laviae* (Philippi, 1844), protoconca; B. *Raphitoma bartolinorum* n. sp., protoconca.

*Raphitoma bartolinorum*  
Pusateri & Giannuzzi-Savelli n. sp.  
(Figs 38, 39B)

= *Raphitoma* aff. *laviae* Romani et al., 2017: 37, figs 8C

### Type material

Holotype: Cannizzaro, Catania 40 m, h: mm 7, d: 2.9, MNHN.

Paratypes: A, Cannizzaro, Catania, 40 m (h: mm 6.6, d: 2.6), MNHN; B, Cannizzaro, Catania, 40 m (h: mm 8.6, d: mm 3.6), coll. Bogi; C, Acitrezza, Catania (h: mm 8.2, d: mm 3.5), coll. Pusateri; D, Cannizzaro, Catania, (h: mm 7.3, d: 3.1), coll. Trono; E, Cannizzaro (Catania 40 m, (h: mm 7.4, d: 3.1), coll. Bartolini.

### Type locality

Cannizzaro (Catania) 37° 32' 28"N 15° 08' 12"E.

### Derivatio nominis

After Stefano and Maria Bartolini, for their contribution to the study of the Mediterranean malacofauna.

### Material examined

The type material and:

France – Cap Taillat (St. Tropez), 1 sh 13 m (HOA).

Sardinia – Capo Coda Cavallo (N.E. Sardegna), (coll. Doneddu, 1 es).

Sicily – Catania 15 m, 1 sh (BOG); Lido Bellatrix (Catania) 40 m, 2 sh (PAG), Cannizzaro (Catania), 23 sh (BAR), 5 sh (CRO), 9 sh (GER), 1 sh (PAO), 2 sh (PAG), 2 sh (MAC); Acicastello (Catania) 38, 1 sh (BOG); Acitrezza, (Catania), 1 sh (SMNH lot 73097B), 1 sh (PUS); Capo Mulini (Acitrezza), 11 sh (SMNH lot 73198B); Ognina (Catania), 5 sh (PAG); Messina, (Lo Scalone, 38° 7' Lat N; 13° 18' Long E), 1 sh 35 m (BAR); Marzamemi (Siracusa), 2 sh (GER); Termini Imerese (Palermo) 2 sh (PUS); Lampedusa Is., 1 sh (SBR), 1 sh (VIL).

Italy – Secche delle Vedove 130 m, 1 sh (PAO). Scilla (Reggio Calabria), 3 sh 40 m (PAO), 1 sh (VAZ).

Cyprus – Nissi Beach, 1 sh (coll. D. Long, NMW lot n. 00126).

### Distribution

Known only on the examined material, from Central and Eastern Mediterranean Sea.

### Description [in square brackets the data of the holotype]

Shell subfusiform of small size for the genus, height: 5-8 [7] mm (rarely exceeding 8 mm) mean: 6.7 (DS 1.40), width: 2.3-3.5 [2.9] mm mean: 2.9 (DS: 0.56). H/W: 2.07-2.75 mean: 2.33, DS: 0.17 [2.41].

Protoconch paucispiral (Fig. 39B), only protoconch I of





**Fig. 40.** *Raphitoma locardi* Pusateri & Giannuzzi-Savelli, 2013. **A.** lectotype here designed, MNHN, (h: 11 mm), Ajaccio (France) [as *Clathurella cylindrica* Locard & Caziot, 1899]; **B.** Marseille (France) (MNHN, h: 10.8 mm); **C.** Ficarazzi, h: 12.1 mm; **D.** Ficarazzi, h: 11.6 mm; **E.** Napoli, h: 13.5 mm; **F.** Campomarino (Taranto), h: 13.5 mm; **G.** Central Saronikos Gulf, 60 m, h: 7.9 mm. (photo courtesy C. Kontadakis).

**Fig. 40.** *Raphitoma locardi* Pusateri & Giannuzzi-Savelli, 2013. **A.** lectotipo qui designato, MNHN, (h: 11 mm), Ajaccio (Corsica) [con il nome di *Clathurella cylindrica* Locard & Caziot, 1899]; **B.** Marseille (Francia) (MNHN, h: 10,8 mm); **C.** Ficarazzi, h: 12,1 mm; **D.** Ficarazzi, h: 11,6 mm; **E.** Napoli, h: 13,5 mm; **F.** Campomarino (Taranto), h: 13,5 mm; **G.** Golfo di Saronikos, zona centrale, 60 m, h: 7,9 mm (foto di C. Kontadakis).



1.4 convex whorls, height: 437  $\mu\text{m}$ , width: 478  $\mu\text{m}$  with nucleus showing open cancellations. Sculpture irregularly cancellate very densely arranged. **Protoconch-teleoconch boundary** slightly indistinct but flexuose. **Teleoconch** of 4-6 [5.5] slightly convex whorls, suture incised in the first whorls, sculpture robust. No microgranules on the surface. **Axial sculpture** of 16-18 [19] (very rarely 20) orthocline or slightly prosocline, equidistant ribs, and interspaces as wide as 1.5 times the the ribs. **Spiral sculpture** on the last whorl of 5-7 [6] cordlets above the aperture, and interspaces as wide as 1.5 times the cordlets. An additional subsutural very close to the first occasionally present in large shells. Cancellation rectangular, with strong and slightly elongat-

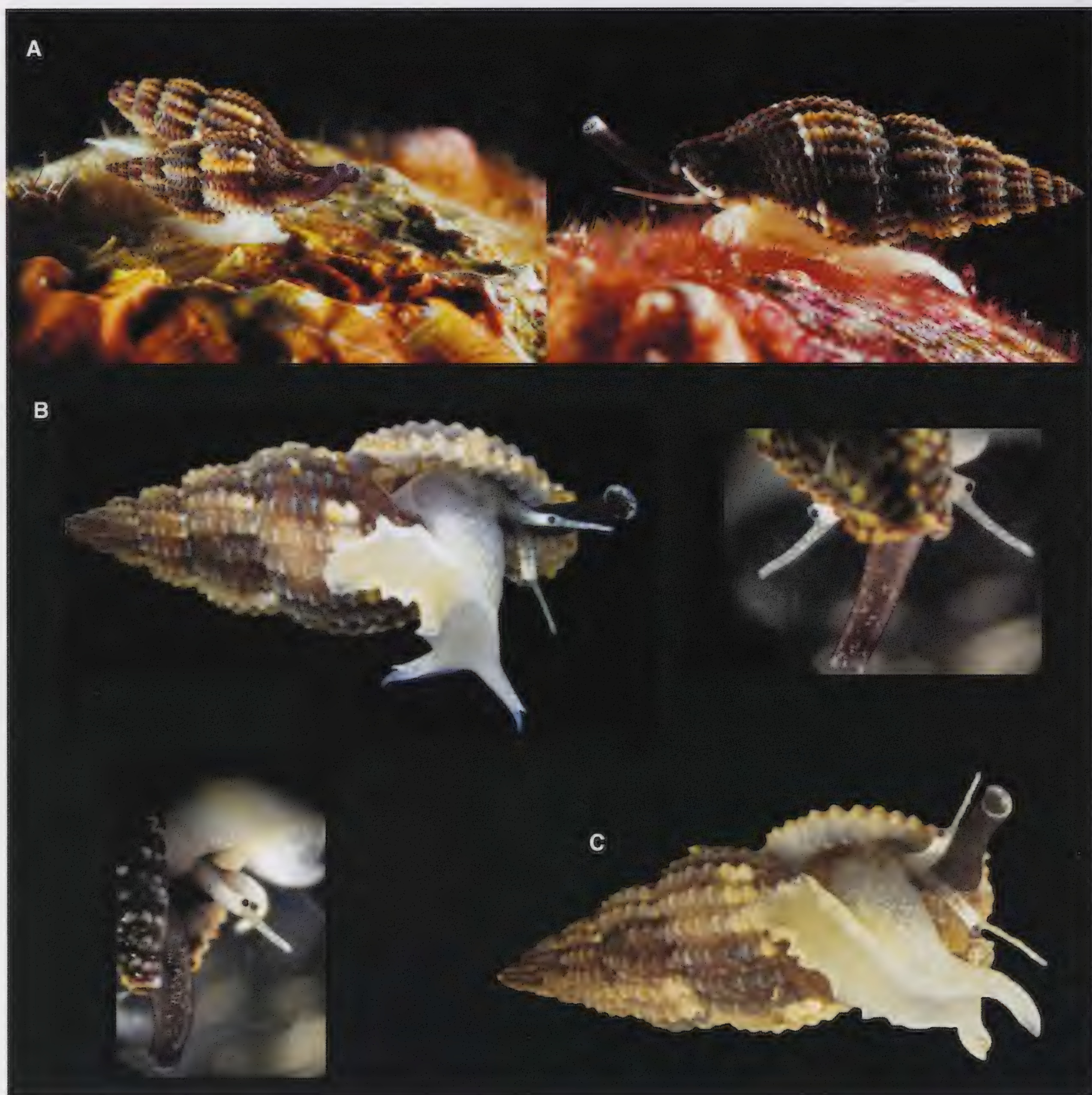
ed pearl-shaped tubercles at the intersections. Tubercles on the subsutural cordlet acutely elevated in the first whorls. **Subsutural** ramp very narrow, with growth scars corresponding to posterior sinus and small tubercles in correspondence with the axial ribs tip and one or two small spiral cordlets.

**Columella** simple, slightly sinuous anteriorly, gently angled posteriorly.

**Outer lip** with 9-10 strong inner denticles, [9] (exceptionally 12), the most anterior delimiting the short siphonal canal.

**Siphonal fasciole** with 6-7 nodulose cords.

**Colour** from ligh to dark orange-brown. Occasional white-whitish tubercles and/or axials. Small comma-



**Fig. 41.** *Raphitoma locardi* Pusateri & Giannuzzi-Savelli, 2013. **A.** Antibes (France); **B.** Central Saronikos Gulf, - 60 m. (Fig. **A.** photo courtesy D. Horst; Fig. **B.** © 2017 Manousis et al. Published in [Organismal and Molecular Malacology, S. Ray ed., OpenTech Publ.] under CC BY 3.0 license. Available from: <http://dx.doi.org/10.5772/67847> [modified]; Fig. **C.** photo courtesy C. Kontadakis.

**Fig. 41.** *Raphitoma locardi* Pusateri & Giannuzzi-Savelli, 2013. **A.** Antibes (Francia); **B.** Golfo di Saronikos, zona centrale, - 60 m. (Fig. **A.** foto di D. Horst; Fig. **B.** © 2017 Manousis et al. pubblicato in [Organismal and Molecular Malacology, S. Ray ed., OpenTech Publ.] under CC BY 3.0 license. disponibile A. <http://dx.doi.org/10.5772/67847> [modificato]; Fig. **C.** foto di C. Kontadakis.





**Fig. 42.** *Raphitoma atropurpurea* (Locard & Caziot, 1899) with axial whitish blotches on the spire. **A.** Gulf of Palermo, h: 15.6 mm; **B.** Capri Is., h: 17 mm.

**Fig. 42.** *Raphitoma atropurpurea* (Locard & Caziot, 1899) con macule biancastre sulla spira. **A.** Golfo di Palermo, h: 15,6 mm; **B.** Capri, h: 17 mm.

shaped spots on the narrow subsutural ramp. Suprasutural cordlet often entirely whitish or white, or with white segments. Rare white shells are known.

**Soft parts unknown.**

## Remarks

*Raphitoma bartolinorum* n. sp. can hardly be mixed with any other congener except its sister, *Raphitoma laviae*, from which it differs in its paucispiral (*vs.* multispiral) protoconch. *R. laviae* is also slightly more robust, less translucent with the inner wall of the aperture lighter, has fewer axials, a more variable coloration, the tubercles slightly less acute.

*R. bartolinorum* n. sp. could perhaps be mixed with very atypical small sized specimens of *R. philberti* with uniform coloration, but the latter will be easily diagnosed by its less robust shell, the tubercles at the intersections never pearl-shaped, and the suprasutural cordlet never whitish/white (nor with white segments).

***R. locardi* Pusateri & Giannuzzi-Savelli, 2013  
(Figs 40-41, 47A)**

*Raphitoma locardi* Pusateri & Giannuzzi Savelli, 2013: 18 (*nomen novum* pro *Clathurella cylindrica* Locard & Caziot, 1899 non Pease, 1860)

*Clathurella cylindrica* Locard & Caziot, 1899: 248 non *Clathurella cylindrica* Pease, 1860

*Clathurella cylindrica* var. *fusca* Locard and Caziot, 1899: 249 (*nomen nudum*)

*Clathurella cylindrica* var. *fusco-albida* Locard and Caziot, 1899: 249 (*nomen nudum*)

*Clathurella cylindrica* var. *major* Locard and Caziot, 1899: 249 (*nomen nudum*)

*Clathurella cylindrica* var. *minor* Locard and Caziot, 1899: 249 (*nomen nudum*)

*Clathurella cylindrica* var. *violacea* Locard and Caziot, 1899: 249 (*nomen nudum*)

*Clathurella cylindrica* var. *violaceo-albida* Locard and Caziot, 1899: 249 (*nomen nudum*)

*Raphitoma* (*Cyrtoides*) *rudis cylindracea* Nordsieck, 1968: 176, pl. 30, fig. 94.22 (see remarks)

*Raphitoma rudis cylindrica* Parenzan 1970: 207, pl. 44, fig. 843 (see remarks)

*Raphitoma* (*Cyrtoides*) *cylindracea* Nordsieck, 1977: 53 (as *cylindrica*) pl. 16, fig. 128 (see remarks)

*Raphitoma* (*Cyrtoides*) *cylindracea* Piani, 1980: 156 (misspelling)

*Raphitoma cylindracea* Sabelli, Giannuzzi Savelli & Bedulli, 1990 (misspelling)

*Raphitoma cylindracea* Repetto, Orlando & Arduino, 2005: 217, n. 892 (misspelling)

*Raphitoma cylindracea* Repetto, Bianco & Ciccimarra, 2011: 41 (misspelling)

*Raphitoma cylindracea* Poppe & Goto, 1991: (misspelling) pl. I, fig. 22 (see remarks)

*Raphitoma locardi* Manousis et al., 2017: 28 figs 3c-d, 4

## Type material

*Clathurella cylindrica* Locard & Caziot: lectotype (11 x 4.3 mm) and one paralectotype (13.2 x 5.2) with handwritten label by Locard “*C. cylindrica*/Ajaccio” (MNHN); 4 paralectotypes from Leucate [Etang de] (very worn and not identifiable shells) (MNHN); 3 paralectotypes from Marseille (MNHN, one sh referable to *R. atropurpurea*, the others not identifiable); 5 paralectotypes from Porquerolles (MNHN); 4 paralectotypes from Toulon (MNHN, 2 sh referable to *R. densa*, the others not identifiable); 6+5 paralectotypes from St. Raphael (MNHN); 4 paralectotypes from St. Tropez (MNHN).

## Type locality

Ajaccio (Corsica).

## Material examined

The type material and:

**Sicily** – Termini Imerese (Palermo), 1 sh (PUS); S. Elia - Porticello (Palermo), 3 sh (GIR); Palermo, 2 sh (PUS); Isola delle Femmine (Palermo), 1 sh (SER); Golfo di Carini 1 sh (PUS).

**Italy** – Isola d’Elba, 1 sh (BAR); Napoli, 1 sh (PUS); Scilla (Reggio Calabria), 1 sh (VAZ); Brindisi 22 m, 1 sh (SMR); Torre Ovo (Taranto), 1 sh (REN).

**Greece** – Saronikos Gulf, 2 sh fide Manousis et al., 2017.

**Cyprus** – Ayia Napa, 1 sh (GIR).

**Turkey** – Bozcaada Is., 2 sh (PUS).

## Description [in square brackets the data of the lectotype]

Shell of medium size for the genus, height: 9-14 mm (mean: 11.03 DS: 0.40) [11], width: 4-5.2 mm (mean: 4.5,



DS 0.55) [4.3]. Sub-fusiform solid, cylindrical, slender. H/W 2.22-2.64, mean: 2.45, DS: 0.13 [2.56]. **Protoconch** multispiral (Fig. 47A). According to Manousis et al. (2017: 28-29) the protoconch is "400 µm (mean) wide and 440 µm (mean) high, bears a protoconch I of 221 µm (mean) and consists of 3.0 convex whorls with nucleus decorated with diagonally cancellate striae and the last whorl with a weak keel before the onset of the teleoconch."

**Teleoconch** of 6-7 convex whorls, with marked suture. Scattered microgranules on the surface on the first whorl of the teleoconch including the ramp. **Axial sculpture** of 15-21 orthocline robust ribs, and interspaces slightly wider than the ribs. **Spiral sculpture** of 6-7 cordlets above the aperture, narrower than the axial ribs. Cancellation rectangular, with small and elongated tubercles at the intersections. Tubercles narrow and



**Fig. 43.** A. *Raphitoma philberti* (Michaud, 1829), original drawings; B. Author's material (sub nomine *Pleurotoma philberti*) from coll. Michaud (MD-CL); D. Locard's label; D-G. Author's material [single specimens identified] (D. *R. atropurpurea*; E. *R. densa*; F. *R. bicolor*; G. *R. cfr. philberti*); H. *Raphitoma philberti* (Michaud, 1829), neotype, Palermo, h: 10.8 mm (Monterosato coll. (MCZR-M-16682).

**Fig. 43.** A. *Raphitoma philberti* (Michaud, 1829), disegni originali; B. Materiale d'autore (sub nomine *Pleurotoma philberti*) dalla coll. Michaud (MD-CL); D. etichetta di Locard; D-G. Materiale d'autore così identificato (D. *R. atropurpurea*; E. *R. densa*; F. *R. bicolor*; G. *R. cfr. philberti*); H. *Raphitoma philberti* (Michaud, 1829), neotipo. Palermo, h: 10,8 mm (Monterosato coll. (MCZR-M-16682).





**Fig. 44.** *Raphitoma philberti* (Michaud, 1829). **A.** Saronikos, h: 6 mm; **B.** Saronikos, h: 8 mm; **C.** Saint Raphael, h: 8.1 mm; **D.** Palermo, h: 12.4 mm; **E.** Napoli, h: 11.7; **F.** Napoli, h: 14.5; **G.** Palermo, h: 8.5 mm; **H.** Capo Linaro, h: 8 mm; **I.** Protoconch variability. (Fig. **A-B.** photo courtesy C. Kontadakis; Fig. **C** photo courtesy G. Devauchelle).

**Fig. 44.** *Raphitoma philberti* (Michaud, 1829). **A.** Saronikos, h: 6 mm; **B.** Saronikos, h: 8 mm; **C.** Saint Raphael, h: 8,1 mm; **D.** Palermo, h: 12,4 mm; **E.** Napoli, h: 11,7; **F.** Napoli, h: 14,5; **G.** Palermo, h: 8,5 mm; **H.** Capo Linaro, h: 8 mm; **I.** Variabilità della protoconca. (Fig. **A. B.** foto di C. Kontadakis; Fig. **C.** foto di G. Devauchelle).



spinulose in subadult specimens. Sculpture visible in transparency throughout the internal shell wall.

**Subsutural ramp** narrow.

**Columella** simple, slightly sinuous medially, gently angled posteriorly.

**Outer lip** with 10-11 strong inner denticles, the most anterior larger and blunt, delimiting the siphonal canal, the most posterior delimiting the anal sinus. Anterior sinus short and wide.

**Siphonal fasciole** with 8-9 strong nodulose cords.

**Coloration** uniformly tawny-reddish, sometimes very dark, with whitish blotches as wide as two axials usually vanishing towards the suture.

**Soft parts** foot sharply bilobed anteriorly, with a small papilla near each tip. Black eyes at proximal 1/3 of the tentacles. Foot and cephalic tentacle whitish hyaline semitransparent, with bright white speakles, head semitransparent dark grey, siphon dark grey with a yellowish stripe covered with white speakles (based on Manousis et al., 2017: 30 fig. 4).

## Distribution

Only known from examined material, probably the entire Mediterranean Sea.

## Remarks

Locard & Caziot, 1899: 248 ascribed this species to "Monterosato (1899)", who in fact has never described it, nor have we found in his collection (at MCZR) any samples labelled with this name. The lectotype was selected on the shell with the best preserved protoconch (missing or severely corroded in all other syntypes referable to this species).

Nordsieck (1968: 176, pl. 30, fig. 94.22) cited "*Raphitoma* (*Cyrtoides*) *rudis cylindracea*" but description and figure do not match the present species. Uncomprehensible is also the link to *Pleurotoma rudis* Scacchi, 1836 non G.B. Sowerby I, 1834 (known under the replacement name *Cordieria pupoides* Monterosato, 1884), a totally different species. Nordsieck (1977: 53, pl. 16, fig. 128) again reported the same taxon as *Raphitoma cylindrica* [sic!] (*cylindracea* in the plate legend), and also in this case description (paucispiral protoconch of 1.5 whorls) and drawing (both different from those of 1968!) do not match this species. Parenzan (1970: 207, pl. 44, fig. 843) evidently mutated his *Raphitoma rudis cylindrica* directly after Nordsieck (1968) and again his description and figure do not match this species. Poppe & Goto (1991: pl. I, fig. 22) figured *R. pupoides* Monterosato, 1884 under the wrong (and misspelled) name of *Raphitoma cylindracea* (also them probably referring to Nordsieck, 1968). Cossignani & Ardovalini (2011) may have figured this species as *R. bicolor* (Cossignani & Ardovalini, 2011: 324, fig. c, d) and *R. philberti* (Cossignani & Ardovalini, 2011: 327, figure a).

*R. locardi* differs from *R. bicolor* (see Fig. 27A) by its more elongated and slender outline, its white blotches shading apically (never shading in *R. bicolor*). It dif-

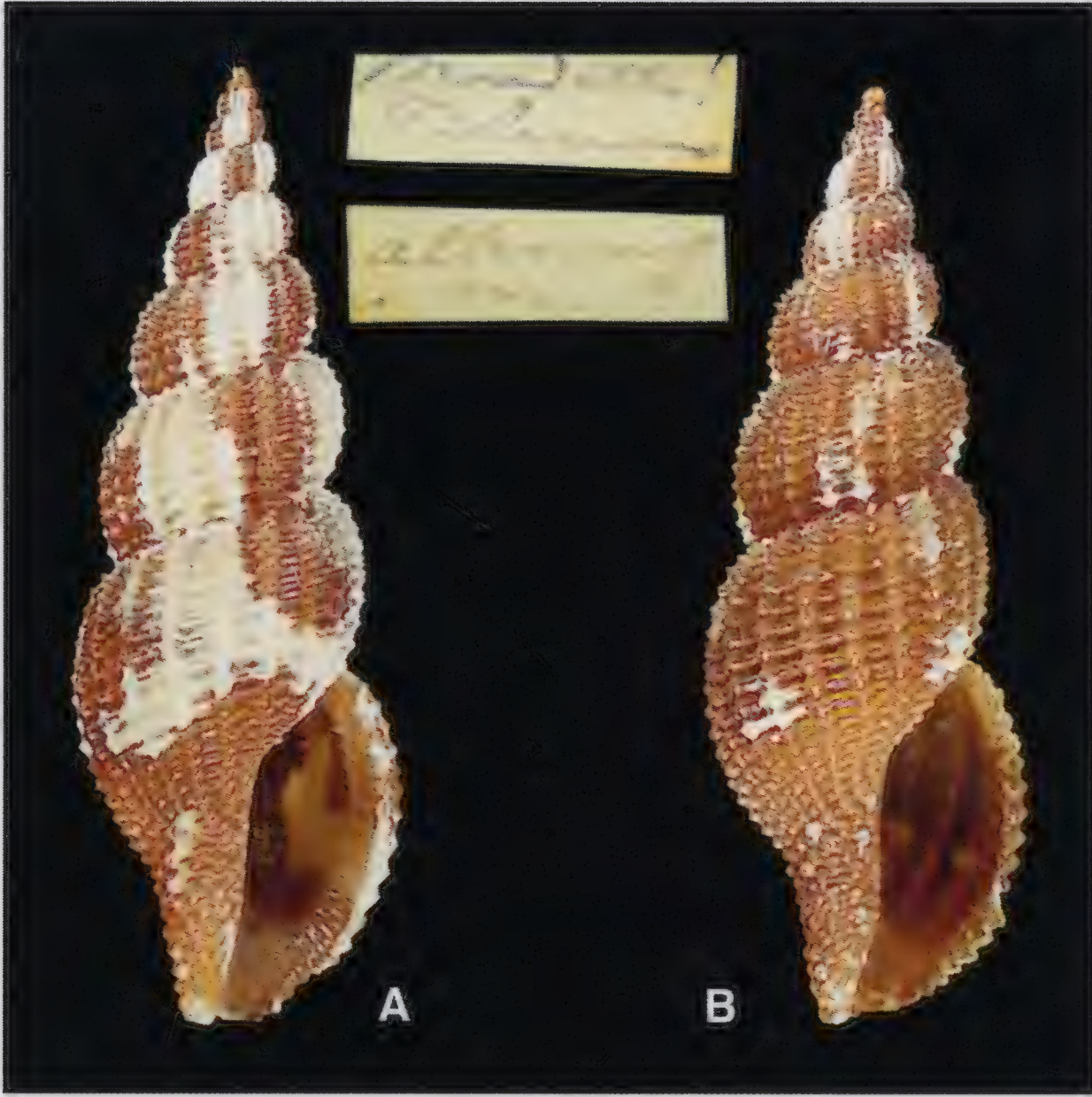
fers from *R. atropurpurea* (see Fig. 42) by its more numerous axial ribs, and the lack of a white cordlet above



**Fig. 45.** Living animals of *Raphitoma philberti* (Michaud, 1829). First, photo courtesy D. Horst; others, photo courtesy J. Prkić.

**Fig. 45.** Animali viventi di *Raphitoma philberti* (Michaud, 1829). La prima, foto di D. Horst; le altre di J. Prkić.





**Fig. 46.** *Raphitoma alternans* (Monterosato, 1884). **A-B.** syntypes MCZR. Both from Mondello (Palermo), h: 17 and 14 mm.

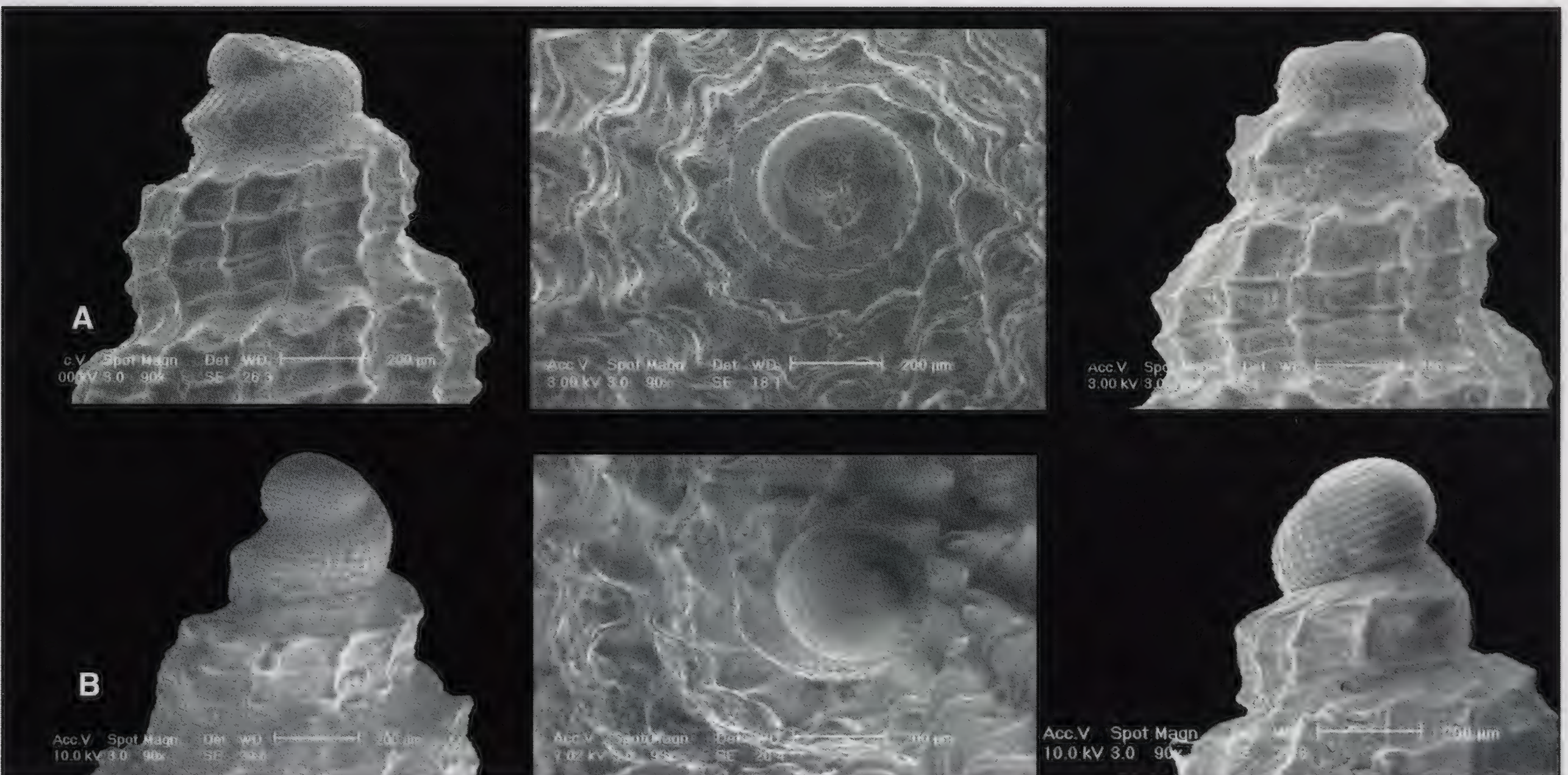
**Fig. 46.** *Raphitoma alternans* (Monterosato, 1884). **A-B.** sintipi MCZR. Entrambi da Mondello (Palermo), h: 17 e 14 mm.

the aperture. *R. laviae* (see **Fig. 35C**) with white blotches is similar, differs being more pupoid, smaller and with different knobs.

***R. philberti* (Michaud, 1829)**  
(Figs 43-45 47B)

*Pleurotoma philberti* Michaud, 1829: 261, figs 2, 3  
*Pleurotoma filiberti* [sic!] Deshayes, 1835: 176  
*Pleurotoma variegatum* Philippi, 1836 [pars]  
? *Pleurotoma versicolor* Scacchi, 1836: 13 [pars]  
*Pleurotoma philberti* Potiez & Michaud, 1838: 447  
*Pleurotoma philberti* Kiener, 1839: 72, pl. 24 fig. 4

*Pleurotoma philberti* Reeve, 1843: pl. 16, sp. 129 (see remarks)  
*Pleurotoma philberti* Forbes, 1844: 139  
*Pleurotoma philberti* Philippi, 1844: 165, pl. 11, fig. 14  
*Raphitoma philberti* Bellardi, 1847: 88  
*Pleurotoma philberti* Requier, 1848: 73  
*Clavatula philberti* S.V. Wood, 1848: 57 pl. 7 figs 5, 5a  
*Defrancia philberti* H. & A. Adams, 1853: 96  
*Pleurotoma philberti* Morris J., 1854: 270  
*Raphitoma philberti* Brusina, 1866: 64  
*Pleurotoma purpurea* var. *philberti* Taslé, 1868 (fide Locard, 1886a)  
*Defrancia purpurea* var. *philberti* Appelius, 1869: 138  
*Defrancia philberti* Tapparone-Canefri, 1869: 19  
*Pleurotoma philberti* Monterosato, 1872: 34, 42  
*Defrancia purpurea* var. *philberti* Monterosato, 1872a: 42 [misspelling]  
*Defrancia purpurea* var. *philberti* Monterosato, 1872b: 51 [misspelling]  
*Pleurotoma purpureum* var. *philberti* Klecak, 1873: 37  
*Pleurotoma* (*Defrancia*) *philberti* Monterosato, 1875a: 44  
*Pleurotoma* (*Defrancia*) *philberti* Monterosato, 1875b: 43  
*Homotoma philberti* Bellardi, 1877: 273  
*Pleurotoma* (*Defrancia*) *philberti* Monterosato, 1877a: 43  
*Pleurotoma* (*Defrancia*) *philberti* Monterosato, 1877b: 38  
*Pleurotoma* (*Defrancia*) *philberti* Monterosato, 1877c: 425  
*Pleurotoma* (*Defrancia*) *philberti* Issel, 1878: 12  
*Pleurotoma philberti* Monterosato, 1878a: 106  
*Pleurotoma philberti* var. *gracilis* Monterosato, 1878a: 106 (*nomen nudum*)  
*Pleurotoma philberti* var. *turgida* Monterosato, 1878a: 106 (*nomen nudum*)  
*Pleurotoma* (*Defrancia*) *philberti* Monterosato, 1878b: 158  
*Raphitoma philberti* Stossich, 1880: 83  
*Pleurotoma philberti* Monterosato, 1880: 229, 233  
*Pleurotoma philberti* Monterosato, 1881: 4  
*Clathurella purpurea* var. *philberti* B.D.D., 1883: 91, pl. 14 n. 13-15 (see remarks)  
*Pleurotoma philberti* Monterosato, 1884: 132  
*Clathurella philberti* [sic!] Locard, 1886a: 122  
*Clathurella philberti* [sic!] Locard, 1886b: 544



**Fig. 47.** Protoconchs. **A.** *Raphitoma locardi* Pusateri & Giannuzzi-Savelli, 2013; **B.** *Raphitoma philberti* (Michaud, 1829).

**Fig. 47.** Protoconche. **A.** *Raphitoma locardi* Pusateri & Giannuzzi-Savelli, 2013; **B.** *Raphitoma philberti* (Michaud, 1829).



- Mangilia (Philbertia) philberti* var. *antiqua* Dollfuss & Dautzenberg, 1886: 102 (*nomen nudum*)
- Defrancia philberti* Horst & Schepman, 1908
- Philbertia philberti* Monterosato, 1923: 11
- Philbertia philberti* Powell, 1942: 45, fig. F34
- Philbertia philberti* Powell, 1966: 7, fig. A3-57
- Raphitoma philberti* Parenzan, 1970: 212, pl. 45, fig. 862
- Raphitoma (Philbertia) philberti* Bombace, 1970: 15
- Defrancia philberti* Greco & Lima, 1974: 95 (2625)
- Homotoma philberti* ibidem, 95 (2676)
- Pleurotoma philberti* ibidem, 99 (1974)
- Raphitoma (Ph.) philberti* Nordsieck, 1977: 56, pl. XVIII fig. 141
- Philbertia philberti* Nordsieck & Garcia Talavera, 1979: 164, pl. 41, fig. 29
- Raphitoma philberti* Bogi et al., 1980: 18-19, fig. 11
- Raphitoma (Philbertia) philberti* Piani, 1980: 157
- Raphitoma philberti* Terreni, 1981: 41
- Philbertia philberti* Van Aartsen, Menkhorst & Gittenberger, 1984: 45, fig. 221
- Philbertia philberti* Sabelli, Giannuzzi Savelli & Bedulli, 1990: 45, 217
- Raphitoma philberti* Poppe & Goto, 1991: 174
- Raphitoma philberti* Barash & Danin, 1992: 160 fig. 182
- Philbertia philberti* Zenetos & Van Aartsen, 1995: 260
- Raphitoma philberti* Cachia et al., 2001: 68, pl. 10, fig. 7
- Raphitoma (Philbertia) philberti* Delamotte & Vardala-Theodorou, 2001: 287
- Philbertia philberti* Demir, 2003: 114
- Raphitoma philberti* Oztürk et al., 2004: 59
- Raphitoma philberti* Cretella et al., 2005: 124
- Raphitoma philberti* Repetto, Orlando & Arduino, 2005: 220 n. 907
- Philbertia philberti* Kabasakal et al., 2005: 71 n. 16 (see)
- Philbertia papillosa* sensu Kabasakal et al., 2005: 71 n. 15 non Pallary, 1904
- Raphitoma philberti* Oliver Baldovì, 2007: 39
- Raphitoma philberti* Cossignani & Arduvini, 2011: 327 (only figs b-e)
- Raphitoma philberti* Manousis, 2012: 180 (figured)

## Type material

Neotype (here designated) from Monterosato collection (MCZR), Palermo, h: mm 10.8, d: 4.21.

## Type locality

Palermo.

## Material examined

The type material and:

"Mediterranean", 1 sh (SMNH lot 73180).

Gibraltar – 1 sh (MCZR-M-16682).

France – Marseille, 1 sh (coll. Locard, MNHN *sub nomine C. variega[ta]*); Cannes, 3 sh (coll. Schlesch, SMNH lot 73084); St. Raphael, 4 sh (coll. Coen, HUIJ *sub nomine Philbertia purpurea bicolor*); 7 sh (MCZR-M-16682).

Corsica – Baie de Calvi, 7 sh (coll. SMNH lot 73171H legit A. Warén); Porto Novo, 1 sh (PAG).

Sardinia – Grotta Ennio Falco, Porto Conte (Sassari), 5 sh (OLI); S'Archittu (Oristano), 12 sh (SOS); Putzu Idu (Oristano), 1 sh (SOS); Cala Mosca (Cagliari), 6 sh (CRO).

Sicily – Messina, 20 sh (MCZR-M-16682); Palermo, 15 sh (coll. Coen, HUIJ lot 8069B *sub nomine Philbertia purpurea philberti*); Ficarazzi (Palermo), 16 sh (PUS); Isola delle Femmine (Palermo), 4 sh (PUS), 12 sh (SER); Golfo di Carini, 2 sh (PAL); Trap.[ani], 1 sh (MCZR-M-16678D); Trapani, 3 sh (SER), 1 sh (PAG); S. Giuliano (Trapani), 1 sh (PAL); Spiaggia di Tramontana (Trapani), 1 sh (BAR), 1sh (MON); Egadi Islands, 1 sh (MMA); Cannizzaro (Catania), 2 sh (PAG); Acicastello (Catania), 2 sh (SMNH lot 73201); Acitrezza (Catania), 25 m 3 sh (CRO); Isola Lachea (Acitrezza, Catania), 5 sh (SMNH lot 73197); Ognina (Catania), 1 sh (PAG); Brucoli (Siracusa), 5 sh (SMNH lot 73204C), 12 sh (SMNH lot 73205A +73206F), 1 sh (SPA), 1 sh (CRO); Marzamemi (Siracusa), 1 sh (GER); Porto Palo (Siracusa), 3 sh (GER); Punta delle Formiche (Pachino, Siracusa), 2 sh (GER); Capo Passero, 1 sh (PAG); Cala Greca (Lampedusa Is.), 1 sh 3 m (PAO), Punta Cappellone (Lampedusa Is.) 45 m, 1 sh (CRO); Secchitella (Linosa Is.), 1 sh 40 m (SMR).

Italy – Savona, 1 sh (RUF); Calambrone (Pisa), 2 sh (PAG); Livorno, 1 sh (PAO); Calafuria (Livorno), 3 sh (BAR); Baratti, 1 sh (PAG); Castiglioncello (Livorno), 7 sh (MAR), 4 sh (PAG); Isola d'Elba, 9 sh (BAR), 1 sh (CRO); Santa Marinella (Roma), 1 sh (PAG); Terracina (Latina) 1 sh (PAG); Zannone Is., 1 sh (RUF); Secca dei Mattoni (Ponza Is.), 26 m 2 sh (CRO); Napoli 20 sh (PUS), 3 sh (coll. Melvill Tomlin, NMW lot 12910), 2 sh (coll. Coen, HUIJ lot 8069A *sub nomine Philbertia purpurea philberti*), 11 sh (MCZR-M-16682); Bacoli (Napoli) 2 sh (CRO); Sorrento (Napoli), 1 sh (TRI); Marina di Puolo (Napoli), 2 sh (DUR); Nerano (Napoli), 1 sh (DUR); Procida Is., 1 sh (PAL), 5 sh (DUR), 2 sh (MON); Punta Pioppeto, Procida 6 m, > 50 sh (CRO), 1 sh (PUS); Capri Is., 2 sh (coll. Melvill-Tomlin, MNW lot 12911 *sub nomine Philbertia philberti* var. *elongata* Monterosato ms.), 3 sh (CRO); Anacapri (Capri Is.), 1 sh 20 m (BOG); Scario (Salerno), 6 m 2 sh (CRO); Marina di Camerota (Salerno), 1 sh (MON); Reggio Calabria, 3 sh (CRO); Scilla (Reggio Calabria), 40 m 1 sh (PAO), 14 sh (VAZ); Santa Trada (Scilla), 1 sh (CRO); Otranto (Lecce), 1 sh (MAC); Porto Cesareo (Taranto), 1 sh (TRO); Campomarino (Taranto), 1 sh (BAR); Cala Rena, Giovinazzo (Bari), 3 sh (CRI), 14 sh (MEL).

Algeria – Alger, 1 sh (MCZR-M-16785) *sub nomine* ms., *aequata*.

Malta – 1sh (MCZR-M-16808); S. Thomas Bay, 2 sh (CRO).

Croatia – Umag, 1 sh (MIC); Veli Rat, 1 sh (MCZR-M-16788); Vir Otok, 1 sh (PKR); Vrsi, 1 sh (PET); Zaton, 9 sh (PKR); Sukosan, 1 sh (PKR), Dugi Otok, 1 sh (PKR); Biograd, 23 sh (PKR), Sabunike, 15 sh (PKR).

Greece – Rhodes Is., 3 sh (PAG); Faragi Arvis (Iraklion, Creta Is.), 1sh (CRO); Kalymnos Is., 1 sh (RAV); Mallia (Creta Is.), 5 sh (CRO); Pefkos (Skiros Is.) 6 m 4 sh (CRO); Sani Calcidica, 1 sh (CRO).

Cyprus – Cape Greco (Ayia Napa), 4 sh (RAV), 1 sh (MTS).

Turkey – Bozcaada Is., 3 sh (OCC).



**Description** [in square brackets the data of the neotype]

**Shell of large size for the genus** height: 6–15 mm, mean: 9.81, DS: 2.26 [10.8], width: 2.5–5.3 mm (mean: 3.99 DS: 0.92 [4.21]). Thin, fusiform, slender, H/W: 2.21–2.81, mean: 2.51 DS: 0.16 [2.56].

**Protoconch paucispiral** (Fig. 47B), only protoconch I of 1.3 convex whorls, height: 367 µm, width: 386 µm. Sculpture irregularly cancellate. Variable in shape and size: more or less elated with more or less protruding nucleus.

**Protoconch-teleoconch boundary** indistinct but oblique.

**Teleoconch** of 5–7 [7] convex whorls, suture evident, sculpture robust. No microgranules on the surface. **Axial sculpture** of 15–20 [19] orthocline ribs, interspaces as wide as the ribs. **Spiral sculpture** of 6–8 [7] cordlets above the aperture, interspaces wider (×2) than the ribs. Cancellation rectangular, with strong and elongated tubercles at the intersections. Sculpture not always visible in transparency throughout the internal shell wall.

**Subsutural ramp** narrow. Two cordlets on the subsutural ramp, the adapical smaller with smaller tubercles.

**Columella** simple, almost straight.

**Outer lip** with 9–11 (10) inner denticles, strong, the most anterior delimiting the siphonal canal and closer to the subsequent than the others, the most posterior delimiting the anal sinus. Denticles 1–2 and 11–12 closer than the others.

**Siphonal canal** short, open.

**Siphonal fasciole** with 8–9 nodulose cords.

**Coloration** uniformly tawny-reddish, from light to dark, with whitish blotches as wide as two axials usually vanishing towards the suture. Comma-shaped white spots on the subsutural ramp.

**Soft parts** foot sharpened bilobed anteriorly. Black eyes at proximal 1/3 of tentacles. Foot and cephalic tentacles whitish/yellowish semi-transparent with many bright white spots, head semi-transparent greyish/blackish. Siphon blackish with whitish spots and a whitish ring at top.

## Distribution

Known from the entire Mediterranean Sea.

## Remarks

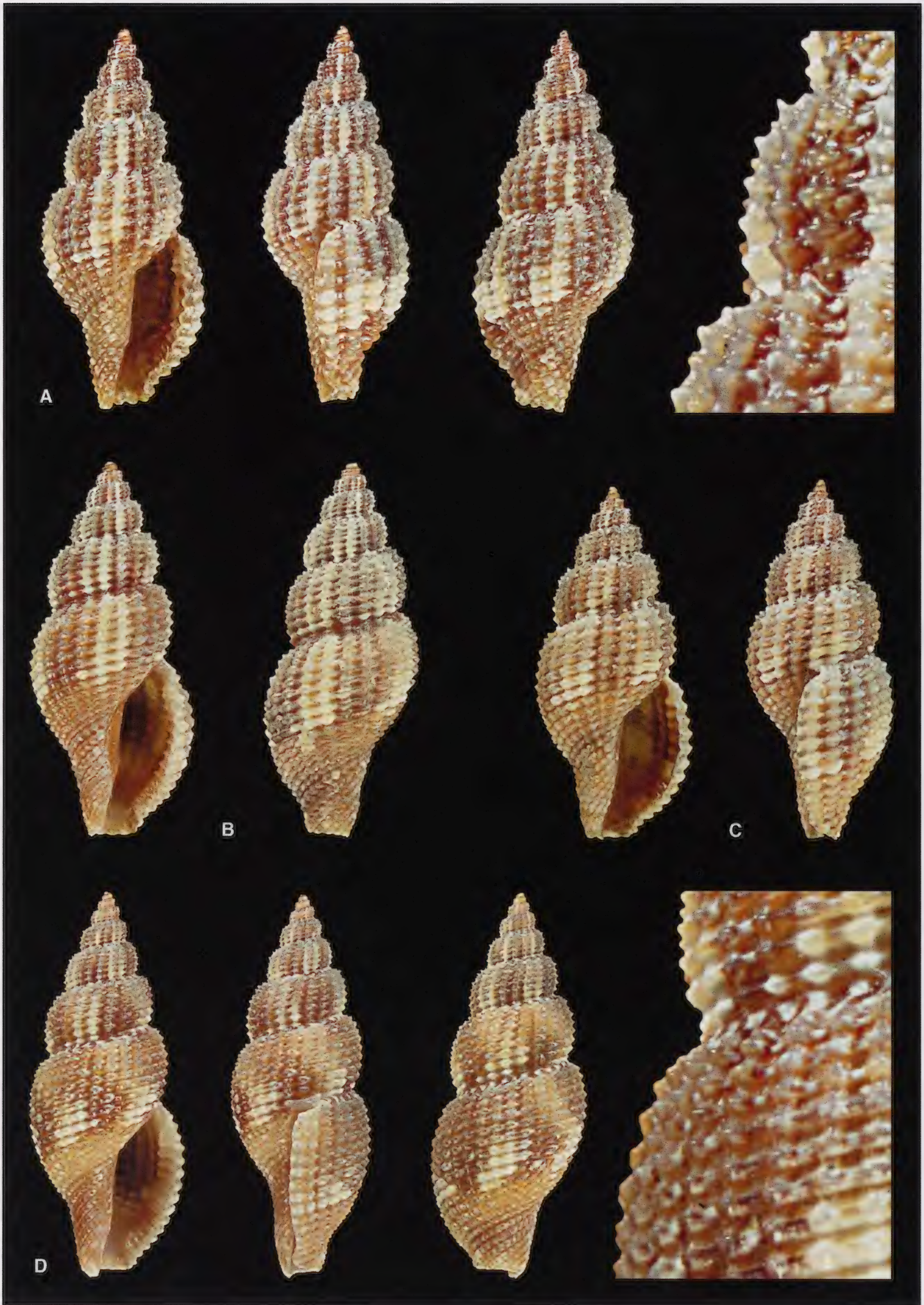
The collection Michaud was in part donated to the Musée of Lyon (now Musée des Confluences), in part passed to the city of Brive by Michaud's son Elysée, and in part was bought by Locard (Locard, 1891: 7). Only the Lyon material remains identifiable (Boyer & Audibert, 2007), the part in Brive having been lost, and the part in Locard's collection having lost the original labels. The possible syntypes of *Pleurotoma philberti* Michaud remaining in Lyon Museum (lot n. 45018066) consist of 4 shells glued (with the apex pointing downward; measuring from left to right: 12.6, 12, 8, and 7.8

mm) on a carton board reading by Michaud handwriting: "Pleur. Philberti Mich./Médit.". There is also an handwritten label by Locard (who worked the Lyon material) reading: "Defrancia/Philberti/Mich/méditerranée/coll. Michaud". This is the same material referred to by Locard (1891: 17). All four shells lack the protoconch and are rather worn not allowing a reliable identification: the first shells could be referred to *R. atropurpurea*, the second to *R. densa* Monterosato, 1884, the third to *R. bicolor* Risso, 1826 and only the fourth (in very bad conditions) might with cautions be referred to *R. philberti* as currently conceived. Noteworthy, none of the four shells matches the size range in the original description (4–5 lines, i.e. 9–11.25 mm). Furthermore, Michaud described the apex (as blunt, "sommets obtus" in the typical, and acute, "sommets aigu" in the varietal specimens) whilst no apex is present in the four shells. Finally, it is clear that Michaud merged more species in his concept of *Pleurotoma philberti* citing a yellowish (jaunâtre) colour (*R. bicolor*) and a grey (grise) one (*R. densa*). Conversely, the restricted concept of *Raphitoma philberti* as conceived herein, i. e. the sister species to *R. locardi*, with a paucispiral protoconch, was rather established in the last 180 years, with very few exceptions mostly due to erroneous identification: Reeve (1843: pl. 16, sp. 129) figured as *R. philberti* what is probably *R. atropurpurea*; pars of the original description by Scacchi (1836: 13 n. 19) of *P. versicolor* is probably referred to *R. philberti*; B.D.D. (1883: 91 pl. 14 n. 13–15) under "*Clathurella purpurea* var. *philberti* Mich.", figured *Raphitoma denseclathrata oblonga* (Dautzenberg & Durouchoux, 1900) (figs 13–14), and *Raphitoma atropurpurea* (Locard & Caziot, 1899) (fig. 15) (see Pusateri et al., 2012); in Cossignani & Ardovalini (2011: 327) their fig. a is *R. bicolor* (figs b–e are *R. philberti*); Kabasakal et al. (2005: 71, fig. 15) figured a *R. philberti* under *Philbertia papillosa* Pallary whilst under *Philbertia philberti* (Michaud) they figured another species (fig. 16); Monterosato considered it as a variety of *R. purpurea* (1872a: 42 e 1872b: 133), as a distinct species describing a paucispiral protoconch (1875a: 44), as a synonym of *R. bicolor* (1875b: 43; 1877a: 43; 1877c: 426 e 1878a: 106; 1880: 229; 1884: 132), as a distinct polymorphic species (1878b: 158; 1881: 4) an opinion eventually maintained until the end (1923). Noteworthy, all material in the Monterosato collection (MCZR) labelled as "*philberti*" matches this concept of the species. All other Authors of which we are aware correctly identified this species. Therefore, in the lack of pedigreed type specimens (with those at Lyon Museum not identifiable with certainty and not unquestionably syntypes) we designate as neotype a shell from Monterosato collection (MCZR-M-16682, which stabilizes the use of the name with the concept of the species adopted in the last 180 years.

*R. philberti* differs from *R. alternans* by its less slender (H/W < 2.6), more solid shell, and the vanishing blotches (vs. sharp in *R. alternans*), see Fig. 46.

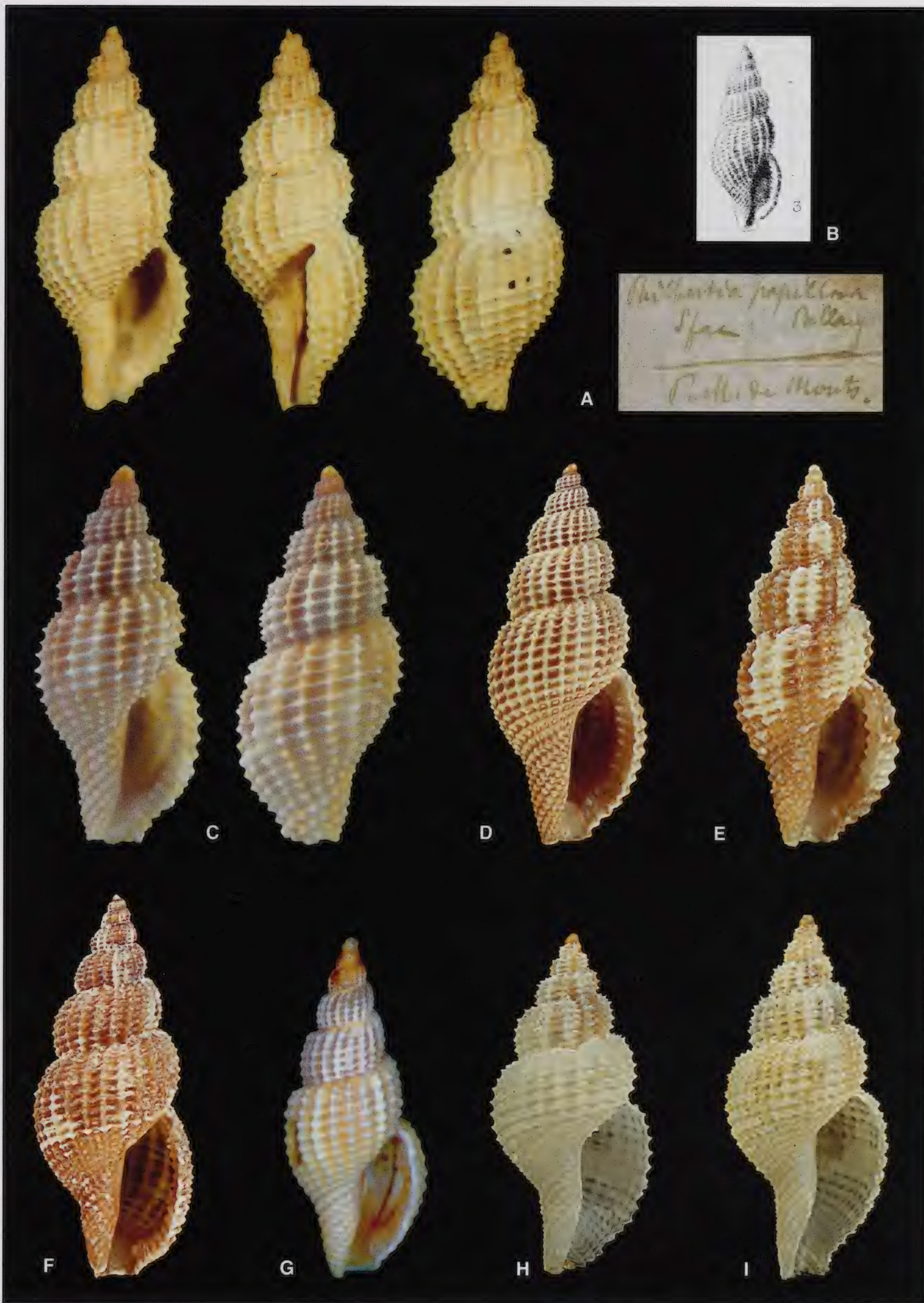
From *R. papillosa* (see Figs, 49–50) *R. philberti* differs by its more solid shell and more robust sculpture, and by





**Fig. 48.** *Raphitoma ebreorum* n. sp. **A.** holotype, Djerba Is. (MNHN, h: 8 mm); **B.** paratype A. Djerba Is. (MNHN, h: 9.1 mm); **C.** paratype B. Djerba Is. (SMNH, h: 6.8 mm); **D.** paratype D. Djerba Is. (CFP, h: 11.7 mm).





**Fig. 49.** *Raphitoma papillosa* (Pallary, 1904). **A.** lectotype, Sfax (MCZR, h: 11 mm) with Pallary's original label; **B.** Pallary's original engraving; **C.** Borj Djillidj (Djerba Is.), h: 10 mm; **D.** Cagliari, h: 10.5 mm; **E.** Djerba, h: 9.7 mm (with 9 denticles); **F.** Djerba, h: 12.5 mm (with 15 denticles); **G.** Lampedusa Is., h: 7 mm; **H.** Kerkennah Is., h: 7.8 mm (H/D: 2.11); **I.** Kerkennah Is., h: 9.1 mm (with 32 axial ribs)

**Fig. 49.** *Raphitoma papillosa* (Pallary, 1904). **A.** lectotipo, Sfax (MCZR, h: 11 mm) con etichetta originale di Pallary; **B.** disegno originale di Pallary; **C.** Borj Djillidj (Djerba), h: 10 mm; **D.** Cagliari, h: 10,5 mm; **E.** Djerba, h: 9,7 mm (con 9 denti); **F.** Djerba, h: 12,5 mm (con 15 denti); **G.** Lampedusa, h: 7 mm; **H.** Kerkennah, h: 7,8 mm (H/D: 2,11); **I.** Kerkennah, h: 9,1 mm (con 32 coste).



its occasionally darker background, very rare in *R. papillosa*. *R. farolita* (see Fig. 30) differs in its less slender outline and more robust shell. *R. bartolinorum* n. sp. (see Fig. 38) could perhaps be mixed with very atypical small sized specimens of *R. philberti* with uniform coloration, but it will be easily diagnosed by its very less robust and more slender ( $H/W > 2.4$  vs.  $< 2.5$ ) shell.

Entirely white specimens are known; Monterosato (1880: 233) reported very dark (almost black) specimens, and the eastern Mediterranean populations (Adriatic and Aegean) have usually a darker background.

#### *Raphitoma ebreorum*

Pusateri & Giannuzzi-Savelli n. sp.  
(Figs 48, 53A)

#### Type material

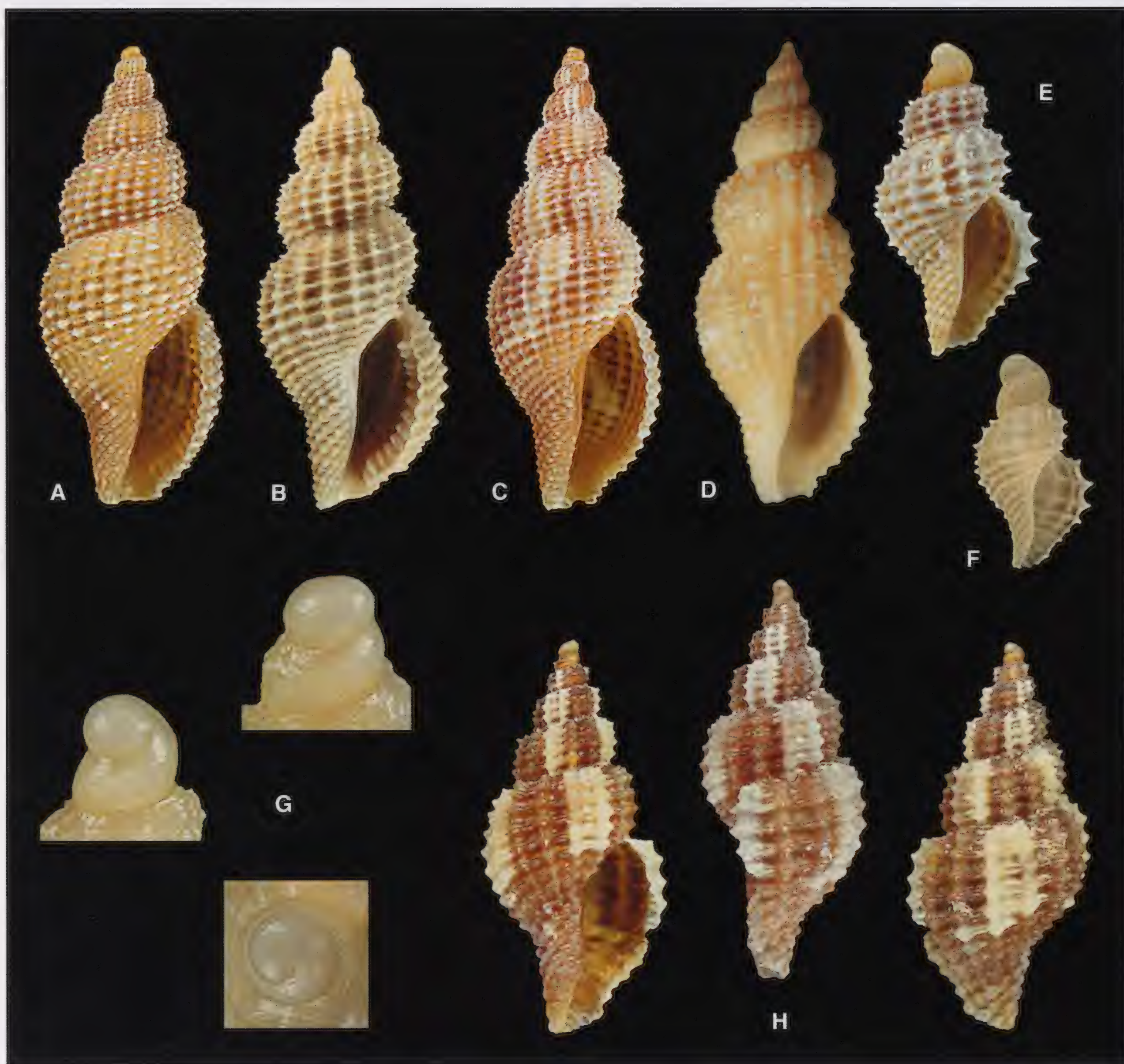
Holotype mm 8 x 3.4 and paratype A mm 9.2 x 4 (MNHN), paratype B mm 7.9 x 3.6 (SMNH) 6.8 x 3, paratype C mm 8.4 x 3.6 (MCZR), paratype D mm 11.6 x 4.8; paratype E mm 11.5 x 4.8; paratype F mm 11.6 x 4.7; paratype G mm 11.1 x 4.7; paratype H mm 10.2 x 4.3 (CFP) all from type locality.

#### Type locality

Djerba Is. (Tunisia).

#### Derivatio nominis

After Claudio Ebreo and his wife Anna, our mentors in the field of malacology.



**Fig. 50.** *Raphitoma papillosa* (Pallary, 1904). **A.** Kerkennah Is., h: 9.7 mm; **B.** Kerkennah Is., h: 9.8 mm; **C.** Kerkennah Is., h: 12.1 mm (H/D: 2.69); **D.** Sfax, h: 9 mm (var. *bedei*); **E.** Kerkennah Is., h: 2.5 mm; **F.** Kerkennah Is., h: 1.5 mm; **G.** protoconchs; **H.** *Raphitoma (Philbertia) bucquoyi sfaxiana* Nordsieck, 1977, Sfax, syntype (SFM n. 337089/2), h: 6.2 mm.

**Fig. 50.** *Raphitoma papillosa* (Pallary, 1904). **A.** Kerkennah, h: 9,7 mm; **B.** Kerkennah, h: 9,8 mm; **C.** Kerkennah, h: 12,1 mm (H/D: 2,69); **D.** Sfax, h: 9 mm (var. *bedei*); **E.** Kerkennah, h: 2,5 mm; **F.** Kerkennah, h: 1,5 mm; **G.** protoconche; **H.** *Raphitoma (Philbertia) bucquoyi sfaxiana* Nordsieck, 1977, Sfax, sintipo (SFM n. 337089/2), h: 6,2 mm.



Material examined

The type material and:

Tunisia – Sfax, 6 sh (MCZR-M-16702 *sub nomine* ms. *Philbertia contigua* var. *serrata*); Sfax 60 miles off, 100 m, 6 sh (SMR); Djerba Is., 15 sh (coll. SMNH lot 73178), 3 sh (coll. SMNH lot n. 73177); Sidi Youssef (Kerkennah Is.), 5 sh (VAZ), 3 sh (PAG). Borj Djillidj, (Djerba Is.), 5 sh (SMNH lot 73177B), legit Bouchet & Waren; Gulf of Gabès, unprecised locality, 5 sh (coll. SMNH lot n. 73175), 8 sh (coll. SMNH lot n. 73176), 1 sh (CEC).

Description [in square brackets the data of the holotype]

Shell of medium size for the genus height: 7-12 [8] mm, mean: 9.59 mm, DS: 1.34, width: 3-4.8 [3.4] mm, mean: 4.06 mm, DS: 0.49. Thin, sub-fusiform, H/W: 2.19-2.63 mean: 2.35, DS: 0.11 [2.35].

Protoconch multispiral (Fig. 53A) of 2.8 convex whorls, heigth: 408 µm, width: 379 µm: protoconch I of 0.8 whorls, width: 188 µm, covered by thin cancellations, protoconch II with a diagonally cancellate sculpture starting after a wide zone under the suture with fine slightly curved axial threads. Last whorl with short and strong keel before the onset of the teleoconch. Protoconch-teleoconch boundary strongly flexuose, opisthocline.

Teleoconch of 5-7 [6] slightly convex whorls, weak suture and sculpture, with inflated last whorl. Microgran-

ules on the surface are present. Axial sculpture of 19-29 [19] slightly opisthocline ribs, and interspaces of irregularly variable size. Spiral sculpture of 7-10 [8] cordlets above the aperture, slightly narrower than the axial ribs. Cancellation subquadrangular, with tubercles at the intersections, small and acutely papillose on the first three whorls, flattened on the remaining whorls. Sculpture visible in transparency throughout the thin internal shell wall.

Subsutural ramp narrow, with occasional white spots. First cordlet at the edge of the ramp, smaller than others, with acute papillae.

Columella simple, almost straight.

Outer lip with 10-13 strong inner denticles [12], the most anterior stronger and delimiting the siphonal canal.

Siphonal fasciole indistinct, with 8-9 strong nodulose cords.

Coloration brown, with wide neatly delimited white blotches. Entirely white specimens known.

Soft parts unknown.

Distribution

This species is known only from the Gulf of Gabès.

Remarks

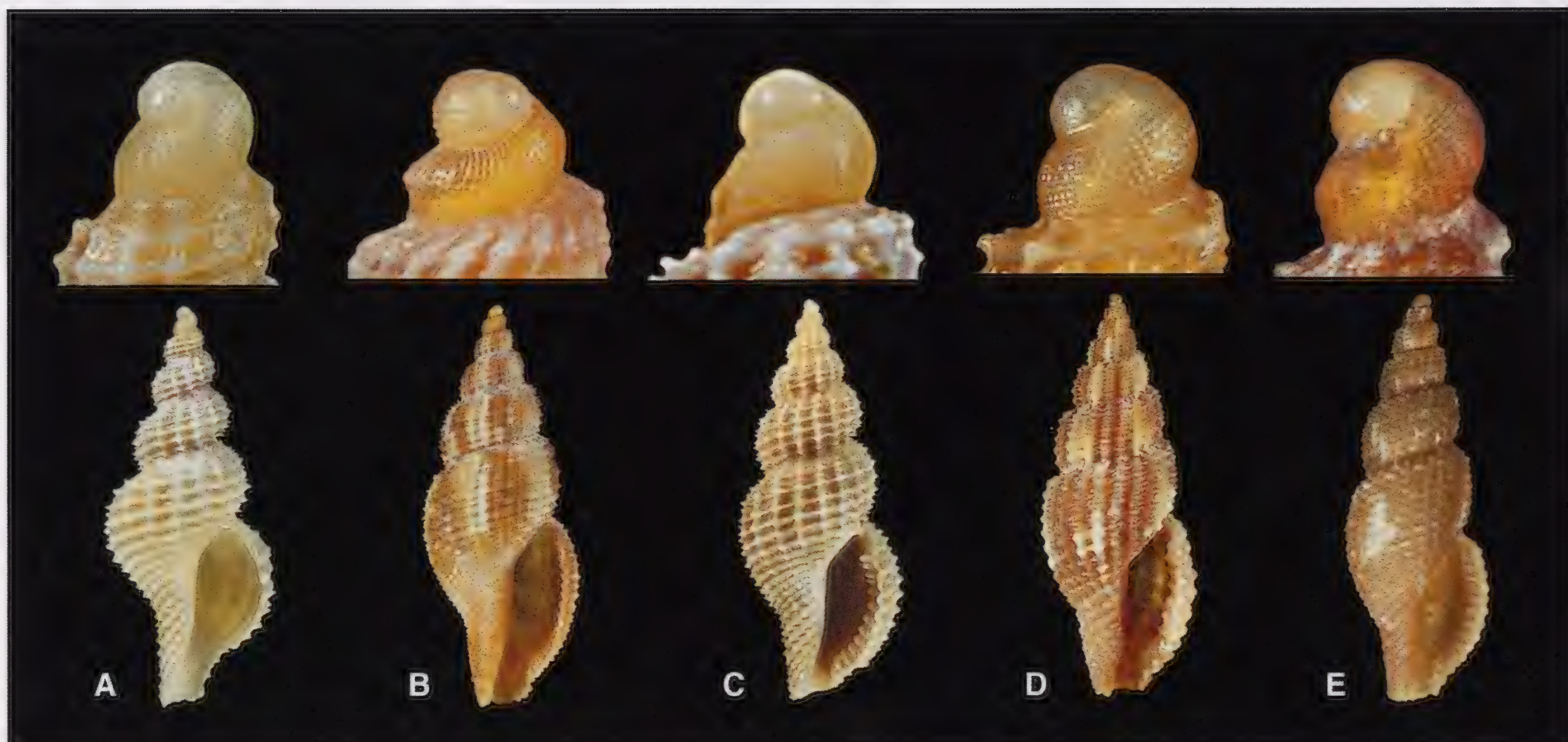
*Raphitoma ebreorum* n. sp. differs from *R. papillosa* (Pallary, 1904), with which is found sympatrically and syn-



Fig. 51. *Raphitoma papillosa* (Pallary, 1904): Living animals from Sidi Jamur (Djerba) - 1 m. (photo courtesy A. Cecalupo.)

Fig. 51. *Raphitoma papillosa* (Pallary, 1904): Animali viventi da Sidi Jamur (Djerba) - 1 m. (foto di A. Cecalupo).





**Fig. 52.** **A.** *Raphitoma arnoldi* (Pallary, 1904), Kerkennah Is., h: 6.4 mm; **B.** *Raphitoma pruinosa* (Pallary, 1906), Kerkennah Is., h: 7.7 mm; **C.** *Raphitoma papillosa* (Pallary, 1904), h: 9.8 mm; **D.** *Raphitoma philberti* (Michaud, 1829), Palermo, h: 10.8 mm; **E.** *Raphitoma alternans* (Monterosato, 1884), Mondello (Palermo), h: 6.6 mm.

**Fig. 52.** **A.** *Raphitoma arnoldi* (Pallary, 1904), Kerkennah Is., h: 6,4 mm; **B.** *Raphitoma pruinosa* (Pallary, 1906), Kerkennah, h: 7,7 mm; **C.** *Raphitoma papillosa* (Pallary, 1904), h: 9,8 mm; **D.** *Raphitoma philberti* (Michaud, 1829), Palermo, h: 10,8 mm; **E.** *Raphitoma alternans* (Monterosato, 1884), Mondello (Palermo), h: 6,6 mm.

topically in the Gulf of Gabès, by its multispiral protoconch (*vs.* paucispiral in *R. papillosa*) see **Fig. 53B**.

*R. ebreorum* n. sp. is also similar to *R. locardi* (**Fig. 40**) by which it differs having microgranules on the teleoconch surface, in its more numerous axials (19-29 *vs.* 15-21) cordlets above the aperture (8-10 *vs.* 6-7) and inner denticles on the outer lip (11-13 *vs.* 10-11), its subquadrangular cancellation (*vs.* rectangular), and its subsutural ramp (very narrow in *R. locardi*).

***Raphitoma papillosa* (Pallary, 1904)**  
(**Figs 49-51, 52C, 53B**)

*Philbertia papillosa* Pallary, 1904: 220, pl. 7 fig. 3

*Philbertia papillosa* var. *bedei* Pallary, 1906: 80

*Philbertia papillosa* Powell, 1966: 134

*Raphitoma* (*Philbertia*) *papillosa* Nordsieck, 1968: 177, pl. 30, fig. 94.36

*Raphitoma papillosa* Ghisotti, 1972: 85, tav. 2 fig. 15

*Raphitoma* (*Philbertia*) *papillosa* Nordsieck, 1977: 56, pl. 18, fig. 142

*Raphitoma* (*Philbertia*) *bucquoyi sfaxiana* Nordsieck, 1977: 57, pl. 18, fig. 145

*Philbertia papillosa* Nordsieck, 1982: 274, pl. 103, fig. 98.31

*Philbertia bucquoyi sfaxiana* (Nordsieck, 1977): 275, pl. 103, fig. 98.34

*Philbertia papillosa* Sabelli et al., 1990: 45, 217

*Philbertia papillosa* Cesari, P. & L. Mizzan, 1994: 184

*Philbertia cylindrica* (Locard & Caziot, 1898), *sensu* Jaux, 2002: 10

*Raphitoma papillosa* Repetto et al., 2005: 219, n. 906

*Raphitoma papillosa* Cecalupo et al., 2008: 123, pl. 69-70 fig. 1

*Raphitoma pruinosa* *sensu* Cecalupo et al., 2008: pl. 70 fig. 2-4

*Raphitoma laviae* *sensu* Cecalupo et al., 2008: pl. 70 fig. 5

*Raphitoma* *cfr.* *lineolata* *sensu* Cecalupo et al., 2008: pl. 70 fig. 6-7

*Raphitoma papillosa* Cossignani & Ardochini, 2011: 31, 327

*Raphitoma papillosa* Manousis, 2012: 180 (figured)

*Raphitoma papillosa* Scaperrotta et al., 2014: 95

## Type Material

*Philbertia papillosa* Pallary – Lectotype (11 x 4.5 mm) here designated and three paralectotypes (13.2 x 4.8 mm, integre shell; 13.9 mm, 12.9 mm, both broken shells) (MCZR-M-16812) with handwritten label of Pallary.

*Raphitoma* (*Philbertia*) *bucquoyi sfaxiana* Nordsieck – 2 juvenile syntypes (6.1 x 2.7mm, 4.3 x 2.1 mm) with label reading. “*Raphitoma bucquoyi sfaxiana*/Sfax/Lotto 337089/2 / Bigl. Orig. Ms. Philb. Bucquoyi sfaxi n. ssp./Sfax”.

## Type Locality

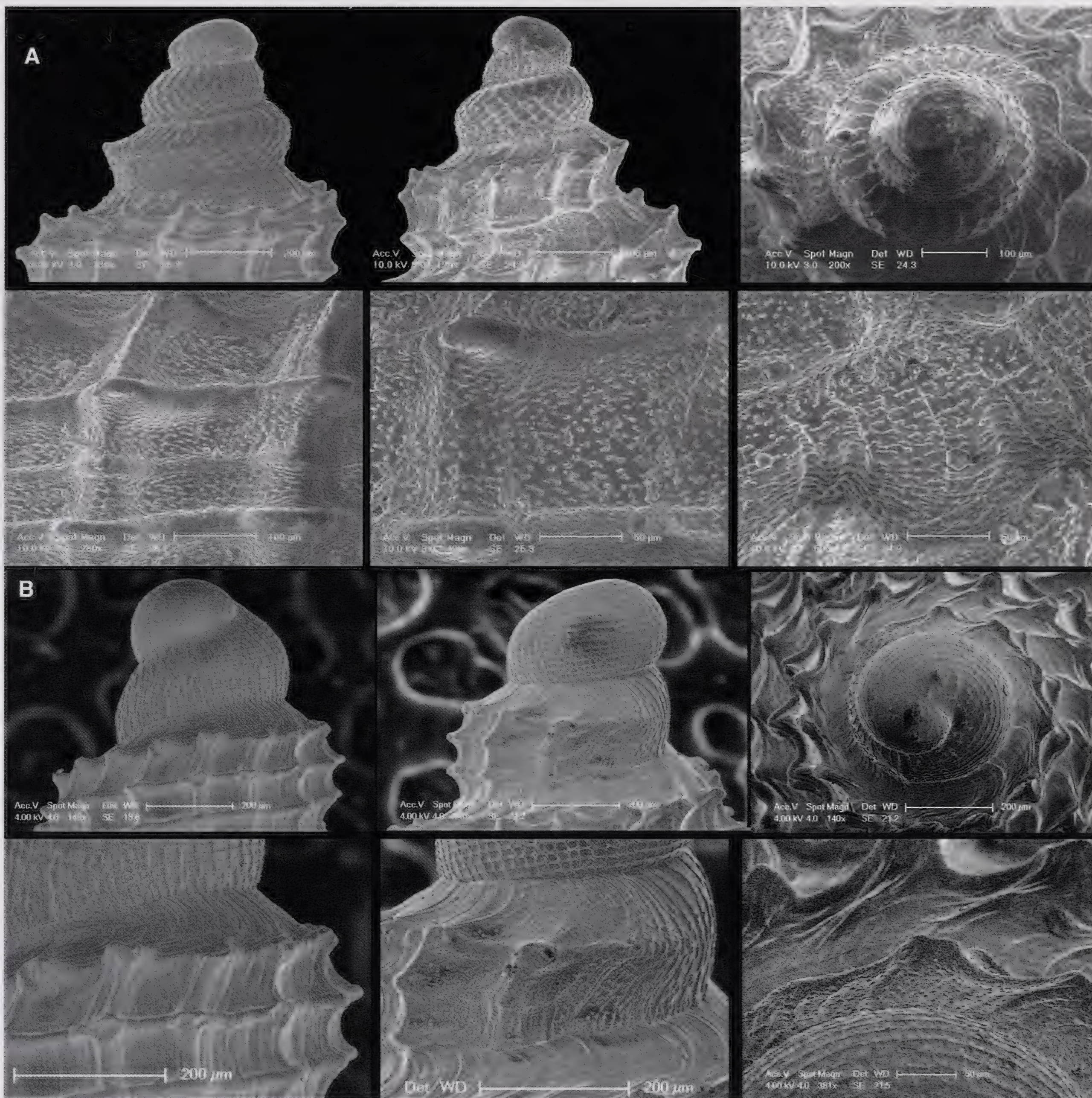
*Philbertia papillosa* Pallary - Sfax. *Raphitoma* (*Philbertia*) *bucquoyi sfaxiana* Nordsieck – Sfax.

## Material Examined

The type material and:

**Tunisia** – Sousse, 4 sh (MCZR-M-16702) *sub nomine* “*contigua*” [error!]; Houmt-Souk (Gulf of Gabès), > 20 sh (SMNH lot 73176A); Djerba Is., 10 sh (PUS), 17 sh (DEL); Port El Kantara (Djerba Is.), 1 sh (DUR); Borj Djillidj, (Djerba Is.), 7 sh (PUS); Golfo di Gabès, >100 sh (SMNH lots 73175A, 73178A, 73177A, 73176A, legit Bouchet & Warén), 11 sh (PUS), 3 sh (TRO), 5 sh (CEC); Kerkennah Is., 9 sh (PUS), 37 sh (RUF), 38 sh (DUR), 35 sh (PAO), > 30 sh (RUS), 14 sh (GER); Sidi Youssef (Kerkennah Is.), 38 sh (CEC), 16 sh (VAZ), > 20 sh (PAG), 1 sh (CRO), 5 sh (PAG), 1 sh (PAD); Sfax, 1 sh





**Fig. 53.** Protoconchs and details of the sculpture. **A.** *Raphitoma ebreorum* Pusateri & Giannuzzi-Savelli, n. sp.; **B.** *Raphitoma papillosa* (Pallary, 1904).

**Fig. 53.** Protoconche e particolari della scultura. **A.** *Raphitoma ebreorum* Pusateri & Giannuzzi-Savelli, n. sp.; **B.** *Raphitoma papillosa* (Pallary, 1904).

(PUS), 1 sh (coll. Coen, HUI., lot 1913, *sub nomine Philbertia tomentosa* Monterosato ms), 1 sh (MCZR-M-16787), 6 sh (MCZR-M-16696) *sub nomine P. tomentosa* Monterosato ms; “Coste d’Africa” (coll. Monterosato, MCZ lot n. 16808).

**Sardinia** – Giorgino (Cagliari), 1 sh (RUF), Porto di Cagliari, 1 sh (MCZR 16662 *sub nomine Philbertia alleryana*), Cagliari, 3 sh (MCZR *sine numero*), 1 sh (PIS).

**Sicily** – Lampedusa Is., 1 sh (SQU).

### Distribution

Considered as endemic to the Gulf of Gabès, sporadic records from Lampedusa Is. and Sardinia seem to witness a range wider than supposed. Conversely the record from northern Adriatic by Cesari & Mizzan (1994) is not deemed to be reliable. Manousis (2012) recorded

this species from Saroniki Gulf and confirmed (com. pers.) that he had personally collected it.

Found living in shallow water (Gabès) under stones or amidst residues of algae or *Posidonia*’s rhizomes.

### Description [in square brackets the data of the lectotype]

**Shell of medium size for the genus** (Figs 1-5; 27A-E), height: 5-15 mm, mean: 9.7 mm, DS: 2.56 [11], width: 2.3-5.6 mm, mean: 4 mm, DS: 0.82 [4.5]. Thin sub-fusiform, H/W: 2.10-2.70 mean: 2.37, DS: 0.16 [2.44].

**Protoconch paucispiral** (Fig. 53B), only protoconch I of 1.4 convex whorls, height: 448  $\mu$ m, width: 388  $\mu$ m variable in shape and size: more or less elated with more or less protruding nucleus. Sculpture irregularly cancellate.



**Protoconch-teleoconch boundary** slightly indistinct but flexuose with scattered microgranules.

**Teleoconch** of 5-7 [6] convex whorls, weak suture and low sculpture, with inflated last whorl. Microgranules on the first half whorl. **Axial sculpture** of 14-32 [22] slightly opisthocline ribs, and interspaces of irregularly variable size. **Spiral sculpture** on the last whorl of 6-8 [7] cordlets above the aperture, slightly narrower than the axial ribs. Cancellation rectangular to subquadrangular, with small and acutely papillose tubercles at the intersections. Sculpture visible in transparency throughout the thin internal shell wall.

**Subsutural ramp** narrow. A very small cordlet at the edge of the ramp with acute papillae. Anal sinus as wide as the ramp but not deep.

**Columella** simple, slightly sinuose on its medial part.

**Siphonal fasciole** indistinct, with 8-10 weakly nodulose cords.

**Outer lip** with 9-15 [12] strong inner denticles sometimes bifid, the second most anterior stronger. Siphonal canal wide and short.

**Coloration** of variable hues of brown, with wide neatly delimited white blotches. Entirely white specimens known. Occasional white comma-shaped spots on the subsutural ramp. Protoconch generally darker than the background.

**Soft parts** white (Cecalupo et al., 2008: 124).

## Remarks

The type material of *Philbertia papillosa* Pallary has not been found at MNHN (V. Heros, pers. comm.). However, in the Monterosato coll. (MCZR-M-16812) we found 4 shells of *R. papillosa* with handwritten label of Pallary from Sfax unquestionably syntypes (plus a shell of *Raphitoma atropurpurea* glued on a cardboard added subsequently to the lot). Among them, all congruent with our concept of this species, we have selected the lectotype. Nordsieck (1977: 57, pl. 18, fig. 145) established *Raphitoma (Philbertia) bucquoyi sfaxiana*, on juvenile specimens of *R. papillosa*, as witnessed by the exam of the two syntypes (SMF, lot 337089/2).

Cecalupo et al. (2008: pl. 70) figured some small *Raphitoma* sp.: the shells of their figs 2a, 2b, 3 and 4 (under *R. pruinosa*), fig. 5 (under *R. laviae*) and figs 6 and 7 (under *R. cfr. lineolata*), are rather all *R. papillosa*.

It is a typical species of the Gulf of Gabès fauna, along with *R. arnoldi* and *R. pruinosa* with which could be mixed. It is the most common of the three, with the less fragile shell (yet the papillose tubercles become rapidly blunt in beached specimens), very variable in shape, sculpture (with a peculiar rectangular to subquadrangular cancellation) and coloration. *R. pruinosa* is easily distinguished by its keeled protoconch (Fig. 52B) the very narrow subsutural ramp, the more numerous axials (30-38 vs. 14-32) spiral cordlets (9-12 vs. 6-8) and inner denticles in the outer lip (15-18 vs. 9-15). *R. arnoldi* has also a very similar protoconch, but is easily diagnosed by the more slender outline, the wider cancellation, the

lack of a true subsutural ramp (replaced by a weak shoulder).

*R. papillosa* differs from *R. philberti* for its more fragile shell, the more numerous axials (14-32 vs. 15-20), the thinner spirals, the acute papillose tubercles (vs. elongate tubercles), the slightly wider subsutural ramp, and the lack of whitish blotches vanishing towards the suture (see Figs 43-44).

*R. papillosa* differs from *R. alternans* by its less slender outline, the less fragile shell, the more incise suture, the broader subsutural ramp (very narrow in *R. alternans*), by its colour pattern never with vertical white blotches (always present in *R. alternans*) (see Fig. 46).

## *R. contigua* (Monterosato, 1884) [Philbertia] (Figs 54, 56A)

*Philbertia contigua* Monterosato, 1884: 133

*Philbertia contigua* Mtr., 1884; Locard & Caziot, 1899: 246

*Clathurella purpurea* var. *contigua* Dautzenberg, Ph. & Durouchoux, P. 1913: 43

*Clathurella contigua* Ruggieri & Greco, 1965: 53, pl. 7, figs 7-8

*Pleurotomoides (Pleurotomoides) contigua* Stolfi Zucchi, 1971: 77, pl. 8, figs 160-161

*Raphitoma contigua* Pusateri & Giannuzzi Savelli, 2012: 41, figs 1-3

*Raphitoma contigua* Manousis et al., 2017: 26 figs 1c-d

*Raphitoma contigua* Manousis et al., 2018: 10 figs 6d-f

## Type material

Lectotype (9.05 x 4.16 mm, MCZR-M-16702/1: Pusateri et al., 2012) and 9 paralectotypes with handwritten label by Monterosato (MCZR-M-16702/1, "Ph. contigua typ. Monts! Palermo" 1 sh; MCZR-M-16702/2, "Ph. contigua Monts. /Napoli Staz. Zool." 3 sh; MCZR-M-16702/3, "contigua Napoli" 2 sh; MCZR-M-16702/4, "R. contigua - Isole Baleari" 3 sh); 16 paralectotypes with handwritten label by Monterosato "Ph. contigua M. / Pal!", coll. Coen in HUJ, 8072 (including 7 specimens of *R. bicolor*); 2 paralectotypes with handwritten Dautzenberg label: "Clathurella purpurea/Montagu/var. Philberti Michaud/St Lunaire/Types Moll. Rouss./ t. I pl. 14 fig. 13,14" (two specimens of *R. denseclathrata*) (MNHN); 1 paralectotype with handwritten Dautzenberg label "Clathurella purpurea/Montagu/var. Philberti Michaud/Roussillon/ Type Moll. Rouss./ t. I pl. 14 fig. 15" (a specimen of *R. atropurpurea*) (MNHN).

## Type locality

Palermo.

## Material examined

The type material and:

Spain – Cadaqués, 2 sh (BAR); Punta de la Mona, 1 sh (PAG); 1 sh (PAD); Puerto S. Antonio (Ibiza Is.), 1 sh (SMNH lot 70485).

France – Marseille, 4 sh (MCZR-M-16811, coll. Monterosato) labelled by Monterosato "*H. conformis*", an unpub-





**Fig. 54.** *Raphitoma contigua* (Monterosato, 1884). **A.** lectotype (MCZR-M-16702/1, h: 9.05 mm) with original label; **B.** Ficarazzi, Palermo, h: 10 mm; **C.** Isola d'Elba, h: 10 mm; **D.** Punta Campanella (Napoli), h: 11 mm; **E.** Roquebrune, Les Issambres (France), h: 9.7 mm, shell with 8 spiral cordlets above the aperture; **F.** St. Raphael (France), h: 7.2 mm; **G.** *Raphitoma oblonga* (Jeffreys, 1867), St. Lunaire (B.D.D., 1883: pl. 14, figs 13, 14), h: 11.6 mm with original label "*Clathurella purpurea* var. *philberti* Michaud" (MNHN, Paris); **H.** *Raphitoma atropurpurea* (Locard & Caziot, 1899), Roussillon (B.D.D., 1883: pl. 14 fig. 15), h: 13.8 mm with original label "*Clathurella purpurea* var. *philberti* Michaud" (MNHN, Paris). (Figs E and F photo courtesy A. Hoarau).

**Fig. 54.** *Raphitoma contigua* (Monterosato, 1884). **A.** lectotipo (MCZR-M-16702/1, h: 9,05 mm) con etichetta originale; **B.** Ficarazzi, Palermo, h: 10 mm; **C.** Isola d'Elba, h: 10 mm; **D.** Punta Campanella (Napoli), h: 11 mm; **E.** Roquebrune, Les Issambres (Francia), h: 9,7 mm, con 8 cordoncini sopra l'apertura; **F.** St. Raphael (Francia), h: 7,2 mm; **G.** *Raphitoma oblonga* (Jeffreys, 1867), St. Lunaire (B.D.D., 1883: pl. 14, figs 13, 14), h: 11,6 mm con etichetta originale "*Clathurella purpurea* var. *philberti* Michaud" (MNHN, Parigi); **H.** *Raphitoma atropurpurea* (Locard & Caziot, 1899), Roussillon (B.D.D., 1883: pl. 14 fig. 15), h: 13,8 mm con etichetta originale "*Clathurella purpurea* var. *philberti* Michaud" (MNHN, Paris). (Figs E and F photo courtesy A. Hoarau).



lished manuscript name); Roquebrune, Les Issambres (Var), 1 sh (HOA); St. Raphael, Cote d'Azur 1 sh labelled "*P. tomentosa*" (MCZR-M-16696, coll. Monterosato).

**Corsica** – Bastia, 1 sh (PUS), 1 sh (MAR), 1 sh (PAD); Alistro (Bastia), 2 sh (MAR).

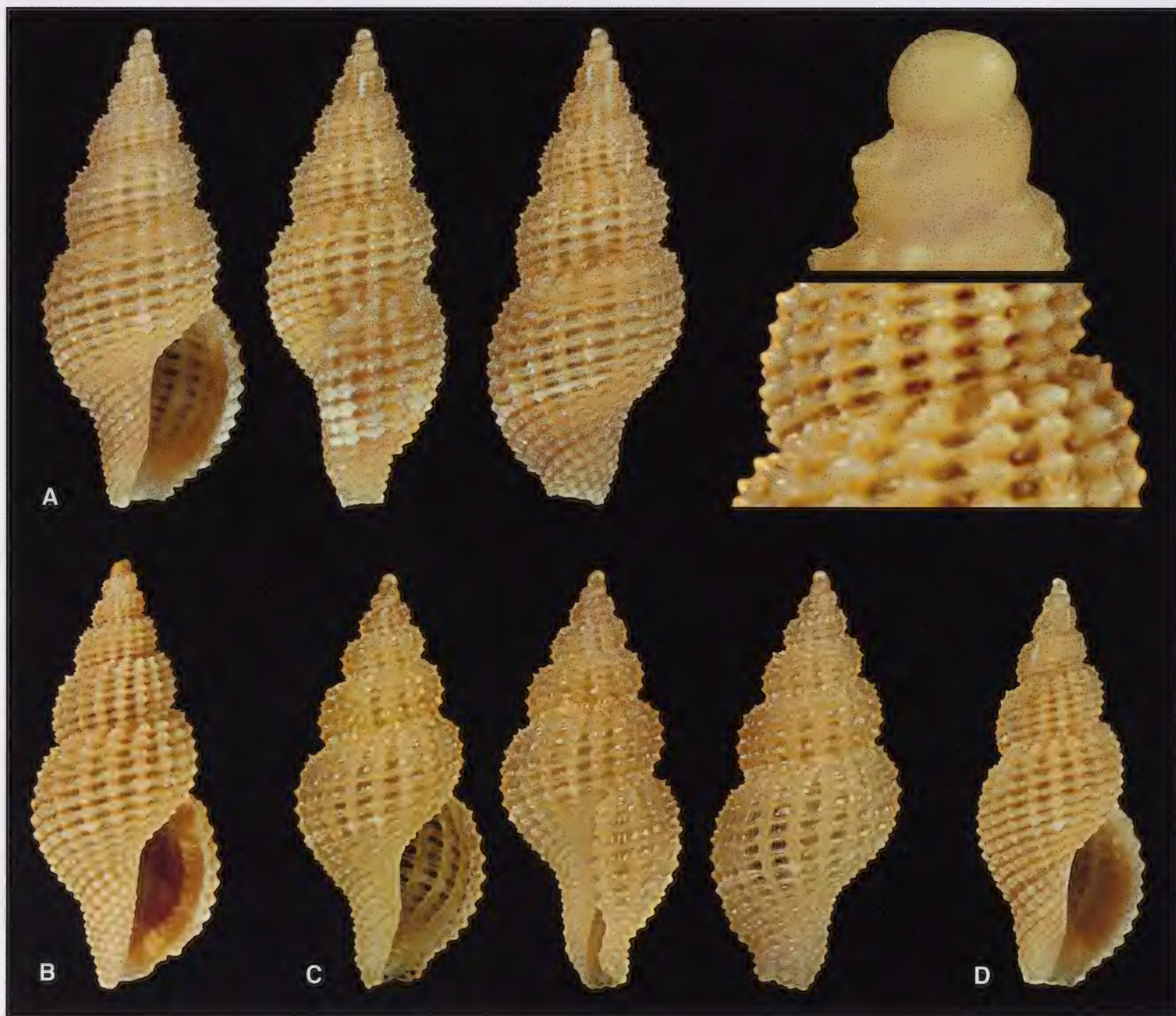
**Sardinia** – Ennio Falco Cave, Porto Conte (Sassari), 3 sh (OLI); La Maddalena Is. 1 sh (RUF) 1 sh (MTS); Oristano, 2 sh (RUF); S'Archittu (Oristano), 2 sh (SOS); Stintino (Sassari), 1 sh (RUF); Torre del Bollo (Alghero), 1 sh (MTS).

**Sicily** – Milazzo (Messina), 1 sh (NOT); Spiaggia Levante (Milazzo, Messina), 1 sh (NOT); Acitrezza (Catania), 10 sh (SMNH lot 73198F); Cannizzaro (Catania), 3 sh (MIC), 2 sh (PAG), 2 sh (PAD); Ognina (Catania), 3 sh (PAG); Palermo, 19 sh (PUS), 2 sh (MCZR-M-16702), 1 sh (HUI), In. 8080 with Coen's label *Philbertia purpurea lineolata* B.D.D.); Aspra, Palermo, 3 sh (GIR); Isola delle Femmine, Palermo, 3 sh (PUS); Gulf of Carini, Palermo 3 sh (PAL), 3 sh (CAL); Trapani, 1 sh (SER); San Vito Lo Capo

(Trapani), 3 sh (BAR); Capo Passero 1 sh (MAR); Taormina, Messina, 1 sh (VIL); Pantelleria Is., 1 sh (BAR).

**Italy** – Genova 2 sh (PUS); Calambrone, Pisa 1 sh (BAR); Livorno 60 m (3 miles off), 1 sh (BOG); Castiglioncello (Livorno), 1 sh (coll. COP), 2 sh (MAR), 1 sh (PAG); 1 sh (PAD); Punta Ala, Grosseto 1 sh (COP); Elba Is., Marina di Campo (Elba Is.), 7 sh (BAR); Elba Is., unspecified locality 4 sh (BAR); Sant'Andrea (Elba Is.), 1 sh (RAV); Tuscan Archipelago, unspecified locality 4 sh (BAR); Giannutri Is. 1 sh (collSMR); Capraia Is., 3 sh (BOG); Civitavecchia, 1 sh, (MCZR-M-16702); Tor Paterno, Marine Protected Area 1 sh (OLI), 1 sh (RUF); Napoli, 1 sh (MCZR-M *sine numero*); Anacapri (Capri Is.), 1 sh (BOG); Punta Campanella, Napoli 2 sh (BAR); Trombetta Cave, Capo Palinuro, 35 m, 1 sh (OLI); Palinuro (Salerno), 1 sh (PAG); Scilla (Reggio Calabria), 1 sh (MAC); Taranto 3 sh (MCZR-M, *sine numero*).

**Croatia** – Korcula Is., 1 sh (MIC); Krk Is., 10+ sh (BAR); Velirat, Dugi Otok, 1 sh (PUS).



**Fig. 55.** *Raphitoma spadiana* Pusateri & Giannuzzi Savelli, 2012. **A.** holotype, Lipari Is. (MNHN-IM-2000-25126), h: 9.6 mm; **B.** paratype A. Lipari Is. (MNHN-IM-2000-25127), h: 8.00 mm; **C.** La Ciotat (France), (MCZR-M-16773 *sine nomine*, h: 8.6 mm; **D.** North Africa coasts "C. [oste] d'Af-fr.[ica]" (MCZR-M unnumbered lot), h: 6.8 mm.

**Fig. 55.** *Raphitoma spadiana* Pusateri & Giannuzzi Savelli, 2012. **A.** olotipo, Lipari (MNHN-IM-2000-25126), **H.** 9,6 mm; **B.** paratipo A. Lipari (MNHN-IM-2000-25127), h: 8,00 mm; **C.** La Ciotat (Francia), (MCZR-M-16773 *sine nomine*, h: 8,6 mm; **D.** "C. [oste] d'Af-fr.[ica]" (MCZR-M lotto non numerato), h: 6,8 mm.



Algeria – Algiers, 1 sh (MCZR-M-16815);  
“C d’Afr.” [Coasts of Africa], 4 sh (MCZR, *sine numero*,  
*sine nomine* coll. Monterosato).  
Greece – Corfu Is., 3 sh (BAR).

## Distribution

Only known from examined material, probably the entire Mediterranean Sea. One record from Galicia by Perez-Dieste (com. pers.) and recorded also from Guernsey Is. (SMNHN lot 73183).

## Description [in square brackets the data of the lectotype]

**Shell of medium size for the genus** height: 9-16 mm, mean: 10.9, DS: 1.70 [9.05], width: 4.5-6 mm, mean: 4.9, DS: 0.49 [4.16]. Solid, sub-fusiform, slender, H/W: 2.12-2.48, mean H/W: 2.24, DS: 0.13 [2.17].

**Protoconch multispiral** (Fig. 56A) of 2.7 convex whorls, height: 325 µm, width: 300 µm, protoconch I of 0.6 whorls, width: 170 µm, with irregularly placed small tubercles; protoconch II of 2.1 whorls, with diagonally cancellate sculpture, and two suprasutural small spiral threads **Protoconch-teleoconch boundary** well marked, slightly flexuose, opisthocline.

**Teleoconch** of 7 convex whorls. No microgranules on the surface. **Axial sculpture** of 16-18 [16] orthocline or slightly opisthocline ribs (occasionally more in larger specimens), and interspaces wider (×1.5) than the ribs. **Spiral sculpture** on the last whorl of 17-20 cordlets, of which 6-7 [6] (rarely 8) above the aperture, slightly narrower than the axial ribs. Cancellation rectangular, with small and elongated tubercles at the intersections. Tubercles on the two adapical cordlets narrow and spinulose (especially in fresh or subadult specimens). Sculpture visible in transparency throughout the internal shell wall.

**Subsutural ramp** narrow, with small tubercles in correspondence with the axial ribs tip.

**Columella** simple, slightly sinuous anteriorly, gently angled posteriorly.

**Outer lip** with 8-9 [9] strong inner denticles (rarely 10-11), the most anterior delimiting the siphonal canal, the most posterior delimiting the anal sinus.

**Siphonal fasciole** with 9-10 strong nodulose cords.

**Coloration** uniformly tawny, rarely darker, sometimes with lighter spots; suprasutural cordlet occasionally white, occasional comma-shaped white spots on the subsutural ramp.

**Soft parts** unknown.

## Remarks

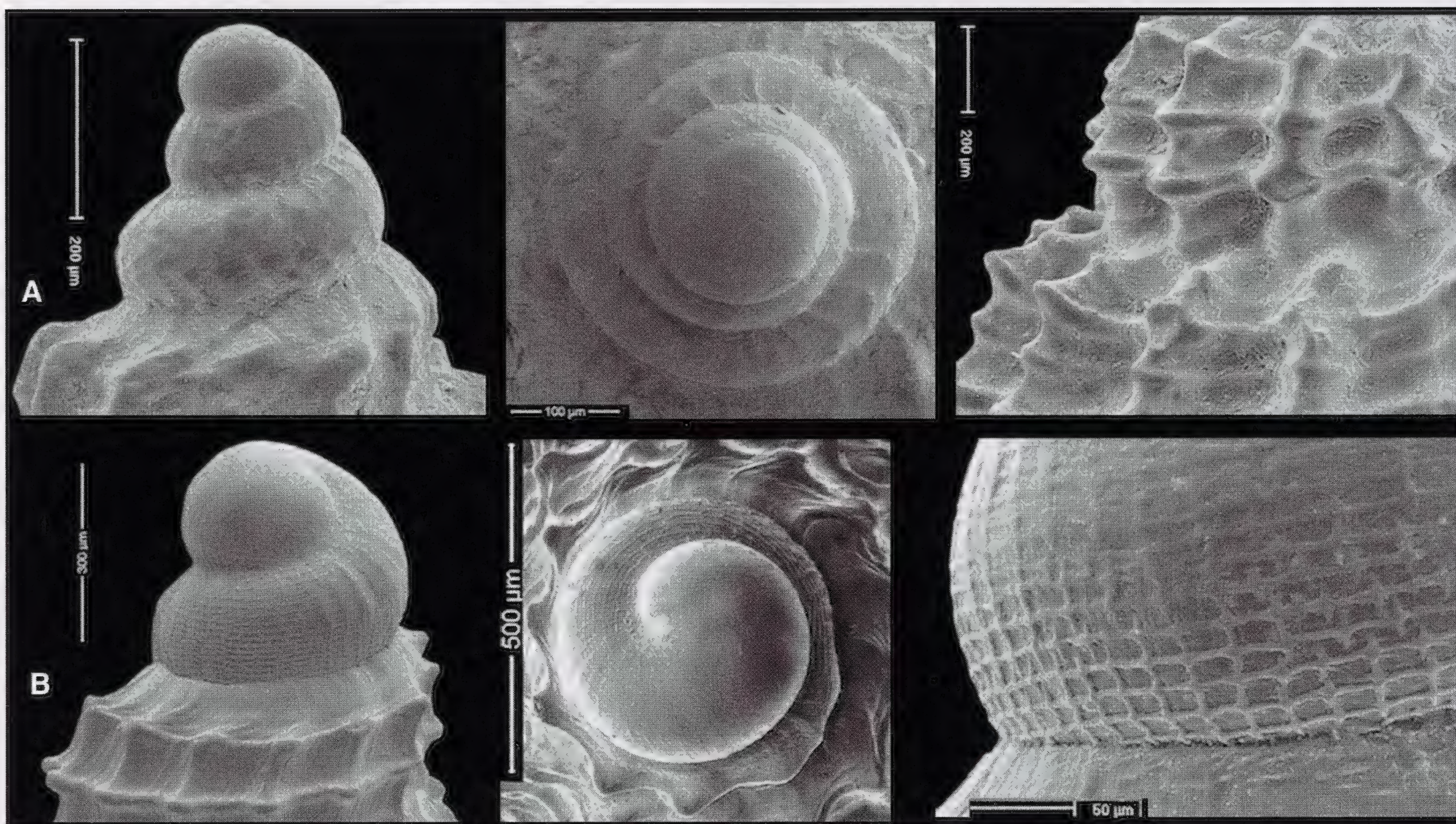
Monterosato (1884: 133) introduced *Philbertia contigua* without any description, but with reference to B.D.D. (1883) as follows: “*P. contigua*, Monts. (*nov. forma*) = *Clathurella purpurea* (non Mtg.) var. *Philberti* (non Mich.), B., D. e D. – l.c. [Moll. Mar. Roussillon] p. 40, t. 14, f. 13-15 (C. di Prov.) =? *Anna Massena* Risso – 1826, p. 214, f.

68 (foss. Alpi Marit.), Isole Baleari (Monjò); Alger (Joly); Bona (Hagenmüller); Palermo e Messina (Monts.); Napoli, Lipari (Tiberi) ecc.” Evidently, Monterosato did not check *de visu* the original material used for B.D.D.’s plates (now stored at MNHN: figs 5-7), relying only on B.D.D.’s figures. In fact, Monterosato cited “C.[oste] di Prov.[enza]” (coasts of Provence), evidently presuming that the figured specimens were all from Provence. Actually, the specimens in B.D.D.’s figs 13 and 14 (MNHN) are labelled as coming from St. Lunaire (Bretagne), and only the shell of fig. 15 is from Roussillon. However, the lots in the Monterosato collection labelled as *Philbertia contigua* are not conspecific with the specimens figured in B.D.D.’s figs 13-14 (Fig. 54G), which are referable to *Raphitoma oblonga* (Jeffreys, 186) a valid species from the Channel area, nor with the specimen figured in B.D.D.’s fig. 15 (Fig. 54H), which is referable to *Raphitoma atropurpurea* (Locard & Caziot, 1899).

Monterosato’s concept of *contigua* remained constant, as we have verified in several collections hosting specimens ex Monterosato (Melvill-Tomlin, National Museum of Wales, lot 12908; Coen, Hebrew University, lot 8072). Evidently, also Dautzenberg & Durouchoux, 1900: 14 and Locard & Caziot, 1899:58, while citing *R. contigua* realized that the material sent to them by Monterosato did not fit B.D.D.’s figures 13-14, and kept *contigua* as a distinct entity. Nevertheless, this does not invalidate that the specific name *contigua* is made nomenclaturally available “by indication” (ICZN art. 12.2), with a type material that encompasses all the localities cited in Monterosato (1884) *R. contigua* (H/W 2.2) is less slender than the most similar species with multispiral protoconch: *R. lineolata* (B.D.D., 1882) (H/W 2.8), *R. atropurpurea* (Locard & Caziot, 1899) (H/W 2.8), *R. densa* (Monterosato, 1884) (H/W 2.8), *R. oblonga* (Jeffreys, 1867) (H/W 2.5). *Raphitoma lineolata* (Fig. 57-58) is very similar in its general aspect, but has a less robust shell and a narrower aperture, lacks the narrow subsutural ramp, and shows always few and scattered white tubercles on the last whorl as well as a subsutural white cord, both lacking in *contigua*. *R. atropurpurea* has a different colour (dark brown-purplish vs. tawny). *R. densa* (Fig. 59B) is more densely sculptured, and has a colour pattern of ash-grey spots over a dark chestnut background. *R. oblonga* is a less known, exclusively Atlantic species, differing from *R. contigua* by its narrower aperture and the constant presence of a white spiral line as long as the space of four axial ribs, starting on the outer lip. *R. alternans* (Monterosato, 1884) (see Fig. 46) has a paucispiral protoconch, and differs also from *R. contigua* in being more slender (H/W 2.6 vs. 2.2), and in its colour pattern of white spots over a dark chestnut background.

Shells with identical teleoconchs of the *contigua* type, but with two distinct protoconch types (multispiral vs. paucispiral) are known, and we consider them as distinct species. The protoconchs in the type material of *Philbertia contigua* Monterosato, are as follows: MCZR-M-16702/1, one shell (lectotype) has a multispiral protoconch, the other lacks protoconch; MCZR-M-16702/2, one lacks protoconch,





**Fig. 56. A.** *Raphitoma contigua* (Monterosato, 1884), protoconch; **B.** *Raphitoma spadiana* Pusateri & Giannuzzi-Savelli, 2012, protoconch and detail of the sculpture.

**Fig. 56. A.** *Raphitoma contigua* (Monterosato, 1884), protoconca; **B.** *Raphitoma spadiana* Pusateri & Giannuzzi-Savelli, 2012, protoconca e particolare della scultura.

two with parts of multispiral protoconch; MCZR-M-16702/3, both with parts of multispiral protoconch; MCZR-M-16702/4, with parts of multispiral protoconch.

***R. spadiana* Pusateri & Giannuzzi-Savelli, 2012**  
(Figs 55, 56B, 61B, 61D)

*Raphitoma spadiana* Pusateri & Giannuzzi-Savelli, 2012: 49, figs 8-13, 15 a-c

*Raphitoma spadiana* Manousis et al., 2017: 33 figs 1 a-b

### Type material

Holotype (MNHN-IM-2000-25126) height 9.6 mm, width 4.1 mm, and paratype A (coll. Pusateri, height 8.0 mm, width 3.7), from Lipari Is.; paratype B (MNHN-IM-2000-25127) height 8.1 mm, width 3.6 mm, from Scilla, 50 m.

### Material examined

The type material and:

Spain – Punta de Albir, 1 sh (CRO).

France – Marseille, 1 sh (coll. Locard, MNHN); La Ciotat (Cote d'Azur), 1 sh (MCZR-M-16773, *sine nomine*).

Sardinia – Alghero, 1 sh (MTS).

Sicily – Mondello (Palermo), 2 sh (PUS); Isola delle Femmine (Palermo), 2 sh (CAL); Acicastello (Catania), 4 sh (CRO); Marettimo Is., 2 sh (AGA).

Italy – Gorgona Is., 1 sh (PAG); Scilla (Reggio Calabria), 20 sh (VAZ), 2 sh (MAC); Taranto 1 sh (PUS); Porto Cesareo, 1 sh (CRO).

Egypt – Alexandria, 2 sh (PUS).

Tunisia – Djerba Is., 1 sh (AGA); "C. d'Afr." [Coasts of

Africa] 1 sh subadult (MCZR, *sine numero, sine nomine*, stored with 4 shells of *R. contigua*).

Greece – Pefko (Skiros Is.), 6 m, 1 sh (CRO); Samos Is. 85 1 sh (STA).

Crete – 1 sh (ALF).

Cyprus – 1 sh (BAR).

Turkey – Taşucu,, 1 sh (STA).

### Type locality

Lipari Is.

### Description [in square brackets the data of the holotype]

**Shell of medium size for the genus** (Figs 1-5; 27A-E) height: 8-11.7 mm, mean: 10, DS: 1.75 [9.5], width: 3.7-4.6 mm, mean: 4.26, DS: 0.36 [4.1]. Solid, sub-fusiform, slender (H/W: 2.12-2.54, mean H/W: 2.28, DS: 0.10 [2.17]).

**Protoconch paucispiral** (Fig. 56B), only protoconch I of 1.25 convex whorls, height: 425 µm, width: 450 µm; sculpture irregularly cancellate. **Protoconch-teleoconch boundary** well marked, slightly flexuose, opisthocline.

**Teleoconch** of 6 convex whorls. No microgranules on the surface. **Axial sculpture** of 16-18 [18] orthocline ribs, sometimes slightly opisthocline in the last whorl, interspaces wider (×1.5) than the ribs. **Spiral sculpture** on the last whorl of 23 cordlets, of which 7-8 [8] above the aperture, slightly narrower than the axial ribs, interspaces wider (×2) than the ribs. Cancellation rectangular, with small and elongated tubercles at the intersections. Tubercles on the two subsutural cordlets narrow





**Fig. 57.** *Raphitoma lineolata* (B.D.D., 1883). **A.** neotype MNHN-IM-2000-25772, St. Raphael (Var, France), h: 7.2; **B.** Ficarazzi (Palermo), h: 15.6 mm; **C.** Termini Imerese (Palermo), h: 8.5 mm; **D.** Palermo, h: 10.7 mm; **E.** Marbella (Spain), h: 10 mm (white form); **F.** Punta de La Polacra (Cabo de Gata, Spain); h: 6 mm.

**Fig. 57.** *Raphitoma lineolata* (B.D.D., 1883). **A.** neotipo MNHN-IM-2000-25772, St. Raphael (Var, Francia), h: 7,2; **B.** Ficarazzi (Palermo), h: 15,6 mm; **C.** Termini Imerese (Palermo), h: 8,5 mm; **D.** Palermo, h: 10,7 mm; **E.** Marbella (Spagna), h: 10 mm (forma bianca); **F.** Punta de La Polacra (Cabo de Gata, Spagna); h: 6 mm.

and spinulose. Sculpture visible in transparency throughout the very thin internal shell wall.

**Subsutural ramp** narrow, with small tubercles in correspondence with the tip of the axial ribs. Two cordlets on the subsutural ramp, the apical smaller with smaller tubercles, the second being the largest of the spirals. The third cordlet, as small as the first one.

**Columella** simple, slightly sinuous anteriorly, gently angled posteriorly.

**Outer lip** with 11-12 (12) strong inner denticles, the most anterior delimiting the siphonal canal, the most posterior delimiting the anal sinus. Denticles 1-2 and 11-12 closer than the others.

**Siphonal canal** short, open.

**Siphonal fasciole** with 8-9 strong nodulose cords.

**Coloration** ranging from light to very light tawny, with rare lighter tubercles. White axial ribs present on all

whorls, or only on some whorls, or finally absent; on the last whorl tenth spiral cordlet and last two axial ribs partly white. Occasional comma-shaped white spots on the subsutural ramp.

**Soft parts** unknown.

### Distribution

Only known from examined material, probably entire Mediterranean Sea.

### Remarks

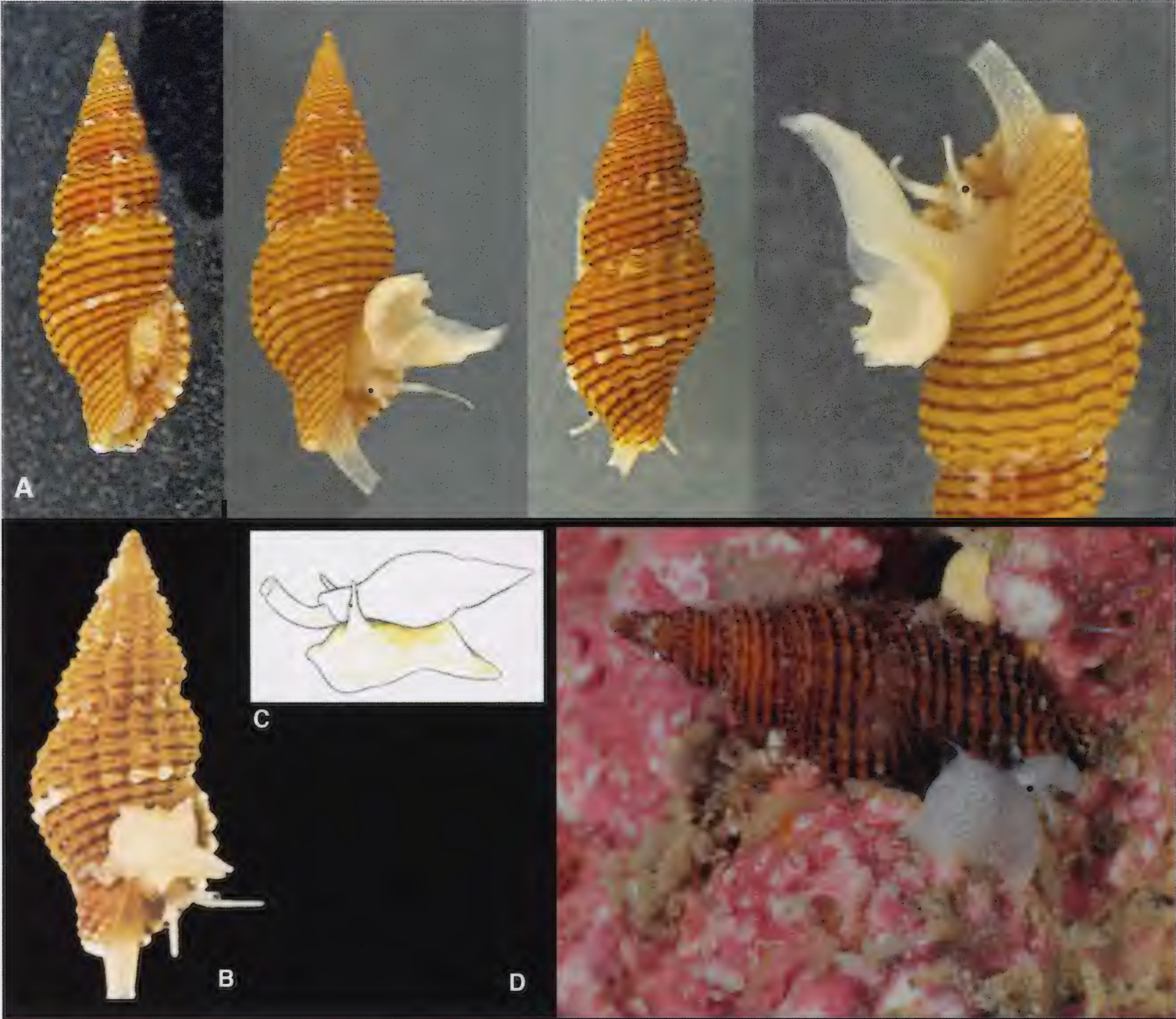
*Raphitoma spadiana* differs from the closely related *R. contigua* (Fig. 54) in its paucispiral protoconch and thus an inferred lecithotrophic development (*vs.* multispiral protoconch and an inferred planktotrophic develop-



ment in *contigua*). Additionally, *R. spadiana* is of slightly smaller size, and lighter in colour.  
*Raphitoma smriglioi* (Fig. 60) is very similar to *R. spadiana* in general aspect, but has a less robust shell, more slender profile, lacks the narrow subsutural ramp, has a narrower aperture, and shows always few and scattered white tubercles on the last whorl as well as a subsutural white cord, both lacking in *contigua*.  
 According to the admittedly limited material examined, *R. spadiana* seems to show some interpopulational variation, even over a short geographic scale (which would be congruent with a non-planktotrophic larval development), with at least one extreme case. A lot of 20 adult shells from Scilla (Calabria) range between 5.2-7.8 mm (mean 6.67) in height, and 2.5-3.9 mm (mean 3.16) in width, with H/W 2.11, and are darker than all other examined shells. Given the small number of shells available overall for comparison, we keep this lot within the putative range of *R. spadiana*.

*R. lineolata* (B.D.D., 1883)  
 [Clathurella pupurea var. lineolata]  
 (Figs 57-58, 62A)

*Clathurella pupurea* var. *lineolata* B.D.D., 1883: 92.  
*Raphitoma* (Philbertia) *pupurea* var. *lineolata* Nordsieck, 1968: 177  
*Raphitoma pupurea* var. *lineolata* Parenzan, 1970: 208  
*Raphitoma* (Philbertia) *lineolata* Nordsieck, 1977: 54, pl. 17, fig. 133  
*Raphitoma* (Philbertia) *lineolata fuscata* Nordsieck, 1977: 54, pl. 17, fig. 134  
*Raphitoma* (Philbertia) *flavida* Nordsieck, 1977: 54 (partim)  
*Raphitoma* (Philbertia) *corbis* sensu Nordsieck, 1977 (partim) non Michaud, 1838  
*Raphitoma lineolata* Bogi, Coppini & Margelli, 1980: 18 figs 9-10  
*Raphitoma lineolata* Rolán, 1983: 270, fig. 257  
*Raphitoma lineolata* Cecalupo & Quadri, 1996: 109  
*Raphitoma lineolata* Doneddu & Trainito, 2005: 149 (fig. 361)  
*Raphitoma lineolata* Repetto, Orlando & Arduino, 2005: 219, fig. 902  
*Raphitoma lineolata* Cossignani & Ardochini, 2011: 326-327



**Fig. 58.** *Raphitoma lineolata* (B.D.D., 1883) living animals. **A.** Veli Garmenjag, Dugi Otok Is., Croatia; **B.** Scilla (Reggio Calabria); **C.** sketch of a living specimen from Acitrezza (Catania); Punta de La Polacra (Cabo de Gata, Spain). (Fig. **A.** photo courtesy J. Prkić; Fig. **B.** photo courtesy A. Vazzana; Fig. **C.** courtesy of D. Scuderi; Fig. **D.** photo courtesy D. Moreno).

**Fig. 58.** *Raphitoma lineolata* (B.D.D., 1883) animali viventi. **A.** Veli Garmenjag, Dugi Otok, Croatia; **B.** Scilla (Reggio Calabria); **C.** disegno di un esemplare vivente da Acitrezza (Catania); Punta de La Polacra (Cabo de Gata, Spagna). (Fig. **A.** foto di J. Prkić; Fig. **B.** foto di A. Vazzana; Fig. **C.** disegno di D. Scuderi; Fig. **D.** foto di D. Moreno).





**Fig. 59. A.** *Raphitoma corbis* (Potiez & Michaud, 1838), Elba Is., h: mm 11.7; **B.** *Raphitoma densa* (Monterosato, 1884), syntype (MCZR-M-16807), Palermo, h: 10.15.

**Fig. 59. A.** *Raphitoma corbis* (Potiez & Michaud, 1838), Isola d'Elba. h: mm 11.7; **B.** *Raphitoma densa* (Monterosato, 1884), sintipo (MCZR-M-16807), Palermo, h: 10.15.

*Raphitoma lineolata* Pusateri et al., 2013: 11

*Raphitoma lineolata* Manousis, 2012: 179 (figured)

*Raphitoma lineolata* Manousis et al. 2017: 28 figs 2 c-d

## Type material

*Clathurella purpurea* var. *lineolata* neotype (Pusateri et al., 2013) MNHN-IM-2000-25772, St. Raphael (Var), France, height: 7.2 mm, width: 2.9 mm. *Raphitoma* (*Philbertia*) *lineolata fuscata* Nordsieck, 1977 (SMF, not examined) *Raphitoma* (*Philbertia*) *flavida* Nordsieck, 1977 (Ibiza, 12 sh, SMF 337099/14, 14 syntypes, including 9 sh of *R. densa*, 3 sh of the *R. bicolor*-complex, 1 sh of *R. lineolata*, 1 sh of *R. cf. corbis*).

## Material examined

The type material and:

**Spain** – Punta de la Mona (Malaga), 18 sh (BAR), 1 sh (PAG); Marbella, 2 sh (GUB); Estepona, 1 sh (RUF); Algeciras, 1 sh (SMNH lot 73168C); Ceuta North, 1 sh (MNHN); Balears Is., 1 sh (PAG); Ibiza Is., 14 sh (coll. Nordsieck, SMF 337090/4, 337091/3 and 337090/9 *sub nomine Philbertia corbis*).

**France** – St. Jean de Luz (Pyrénées-Atlantiques), 1 sh (MNHN, coll. H. Fischer); Le Brusc (Var), 1 sh (MNHN); Iles Embiez (Var), 4 sh (MNHN).

**Corsica** – Îles Cerbicale, 2 sh (SMR); Calvi, 52 sh (SMNH lots 73171I, 73171M), 2 sh (PUS); Bastia, 1 sh (MAR), 2 sh (MCZR-M-16786).

**Sardinia** – La Maddalena Is., 3 sh (RUF); Ennio Falco cave (Portoconte, Sassari), 3 sh (OLI); Nodu Pianu (Olbia), 1 sh (CRO); Stintino (Sassari), 1 sh (RUF); Tres Nuraghes (Oristano), 1 sh (PAL); S'Archittu (Oristano), 15 sh (SOS), 3 sh (CRO); Porto Istana (Olbia), 1 sh

(DON); Porto Alabe (Nuoro), 5 sh (MTS); Alghero, 1 sh (MTS), 1 sh (OCC).

**Sicily** – Palermo, 1 sh (MCZR-M-16678a), 4 sh + 2 sh *sub nomine* ms. “*acuminata*” (MCZR-M-16786), 8 sh (MCZR-M-16808) *sub nomine* ms. “*subtilis*”; Carini (Palermo), 1 sh (MCZR-M-16793), 1 sh (MCZR-M-16808); Isola delle Femmine (Palermo), 3 sh (PAL), 1 sh (SER), 1 sh (CRO); Ficcarazzi, (Palermo), 12 sh (PUS); Trapani, 1 sh (OCC); Lo Scalone (Messina), 4 sh (BAR); Lipari Is., 1 sh (coll. Monterosato, MCZ lot 16877); Milazzo (Messina), 1 sh (NOT); Spiaggia Levante (Milazzo, Messina), 1 sh (NOT); Ustica Is., 3 sh (VIL); Acitrezza (Catania), 1 sh (SMNH lot 73097B), Isola Lachea (Acitrezza), 9 sh juv. (SMNH lot 73197B); Pozzillo Inferiore (Acireale), 2 sh (PAG); Cannizzaro (Catania), 3 sh (RUF), 2 sh (PAG), Cannizzaro; Ognina (Catania), 1 sh (GER); Marzamemi (Siracusa), 1 sh (GER); Capo Passero (Siracusa), 1 sh (MAR); Porto Palo (Siracusa), 3 sh (GER); Macari (Trapani), 1 sh (PAG); Pantelleria Is., 2 sh (BAR); Lampedusa Is., 1 sh (AGA); Lipari Is., 1 sh (MCZR lot 16877).

**Italy** – Riva Trigoso (Ge) 20 m, 5 sh (SOS), 2 sh (REP); Boccadasse (Genova), 50 m, 1 sh (REP); Castiglione, 8 sh (MAR), 3 sh (BAL), 1 sh (PAG); Bagni Fiume (Livorno), 1 sh (MAR); Sant'Andrea (Isola d'Elba), 2 sh (RAV); Gorgona Is., 1 sh (BAL); Giglio Is., 1 sh, (BAL); Capraia Is., 2 sh (PAG); Argentario 35 m, 1 sh (SMR); Gulf of Baratti, 8 sh (BAL), 1 sh (NOF); Giannutri Is., 2 sh (AGA), 3 sh (SMR); Antignano (Livorno), 1 sh (GOR); Calambrone (Pisa), 4 sh (BAR); Montalto di Castro (Viterbo), 5 sh (OCC); Capo Linaro (Roma), 1 sh (RUF); Nettuno (Roma), 1 sh (OCC); Procida Is., 1 sh (MON); Punta Campanella 40 m, 1 sh (PAG); Capri Is., 1 sh (coll. Coen, HUJ lot 11218 *sub nomine* ms. “*Philbertia purpurea mitis* M.”); Anacapri (Capri Is.), 1 sh (BOG); Reggio Calabria, 3 sh (NOT); Porto Cesareo, 1 sh (TRO), 2 sh (FIO); Campomarino (Taranto), 1 sh (DIN); Porto S. Caterina (Lecce), 1 sh (BIN), 2 sh (TRO); Otranto channel, 1 sh (TRO); Torre Inserraglio (Lecce), 2 sh (TRO); Gallipoli (Lecce), 1 sh (CRO); Giovinazzo (Bari), 1 sh (MEL); Novaglie (Lecce), 1 sh (MAC); Civitanova Marche (Macerata), 1 sh (CRO); Scilla (Reggio Calabria), 11 sh (VAZ). **Croatia** – Verunic, 2 sh (PUS); Veli Rat, 5 sh (coll. Melvill-Tomlin, NMW lot 12919, *sub nomine* ms. “*Philbertia subtilis*” Monterosato; Krk Is., 5 sh (BAR); unspecified locality, 4 sh (DEL).

**Malta** – unspecified locality, 5 sh (MIF); Wied Iz Zurrieg, 1 sh (ART).

**Tunisia** – Sfax, 1 sh (coll. Stadt, MNHN).

**Cyprus** – off Larnaka, 42 m, 1 sh (BAR).

**Turkey** – Adana, 1 sh (CGS).

**Greece** – Pefko (Skiros Is.), 3 sh (CRO).

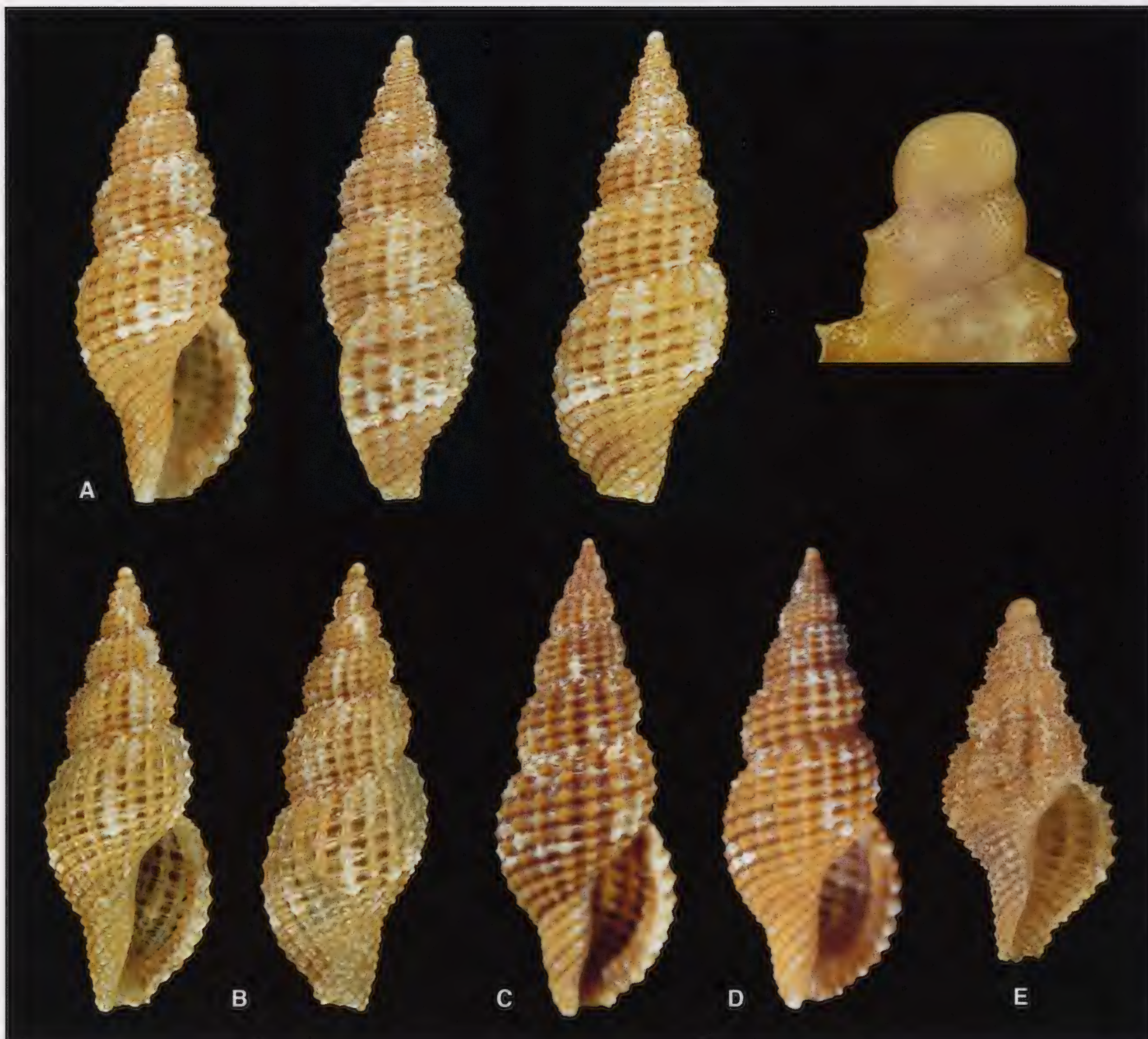
## Type locality

Off St. Raphael (Var), France.

## Distribution

We have examined materials from the northern, central and eastern Mediterranean, and from the southern Bay





**Fig. 60.** *Raphitoma smriglioi* Pusateri & Giannuzzi-Savelli, 2013. **A.** holotype, MNHN-IM-2000-25771, Ognina (Siracusa, Italy), h: 9.4 mm; **B.** paratype **D.** Brucoli (Siracusa), h: 8.7 mm; **C.** Murter Is. (Croatia), h: 12.3 mm; **D.** Dalmatia (Croatia), h: 10.4 mm; **E.** paratype B. MNHN, Ognina (Siracusa), h: 5.9 mm. (Figs. **C**, **D** photo courtesy J. Prkić).

**Fig. 60.** *Raphitoma smriglioi* Pusateri & Giannuzzi-Savelli, 2013. **A.** olotipo, MNHN-IM-2000-25771, Ognina (Siracusa), h: 9,4 mm; **B.** paratipo **D.** Brucoli (Siracusa), h: 8,7 mm; **C.** Murter (Croazia), h: 12,3 mm; **D.** Dalmazia (Croazia), h: 10,4 mm; **E.** paratipo B. MNHN, Ognina (Siracusa), h: 5,9 mm. (Figs. **C**, **D** foto di J. Prkić).

of Biscay in the Atlantic. It has also been recorded in the Ría de Vigo by Rolán Mosquera (1983: 270).

#### Description [in square brackets the data of the lectotype]

**Shell of medium size for the genus** height: 7.5-15.9 (rarely exceeding 15 mm), mean: 10.3 mm, DS: 2.2 [7.2], width: 3.5-4.4 mm, mean: 3.8, DS: 0.7 [2.9]. Thin, fusiform, slender, H/W: 2.45-2, mean: 2.67, DS: 0.15 [2.48]. **Protoconch multispiral** (Fig. 62A) of 2.7 convex whorls, height: 315 µm, width: 325 µm; protoconch I of 1.2 whorls, width: 230 µm, with irregularly cancellate sculpture; protoconch II of 1.5 whorls, with subsutural axial threads and a diagonally cancellate sculpture on the lower part of the spire. **Protoconch-teleoconch boundary** well marked, slightly flexuose, opisthocline. **Teleoconch** of 5-8 (5) convex whorls with evident su-

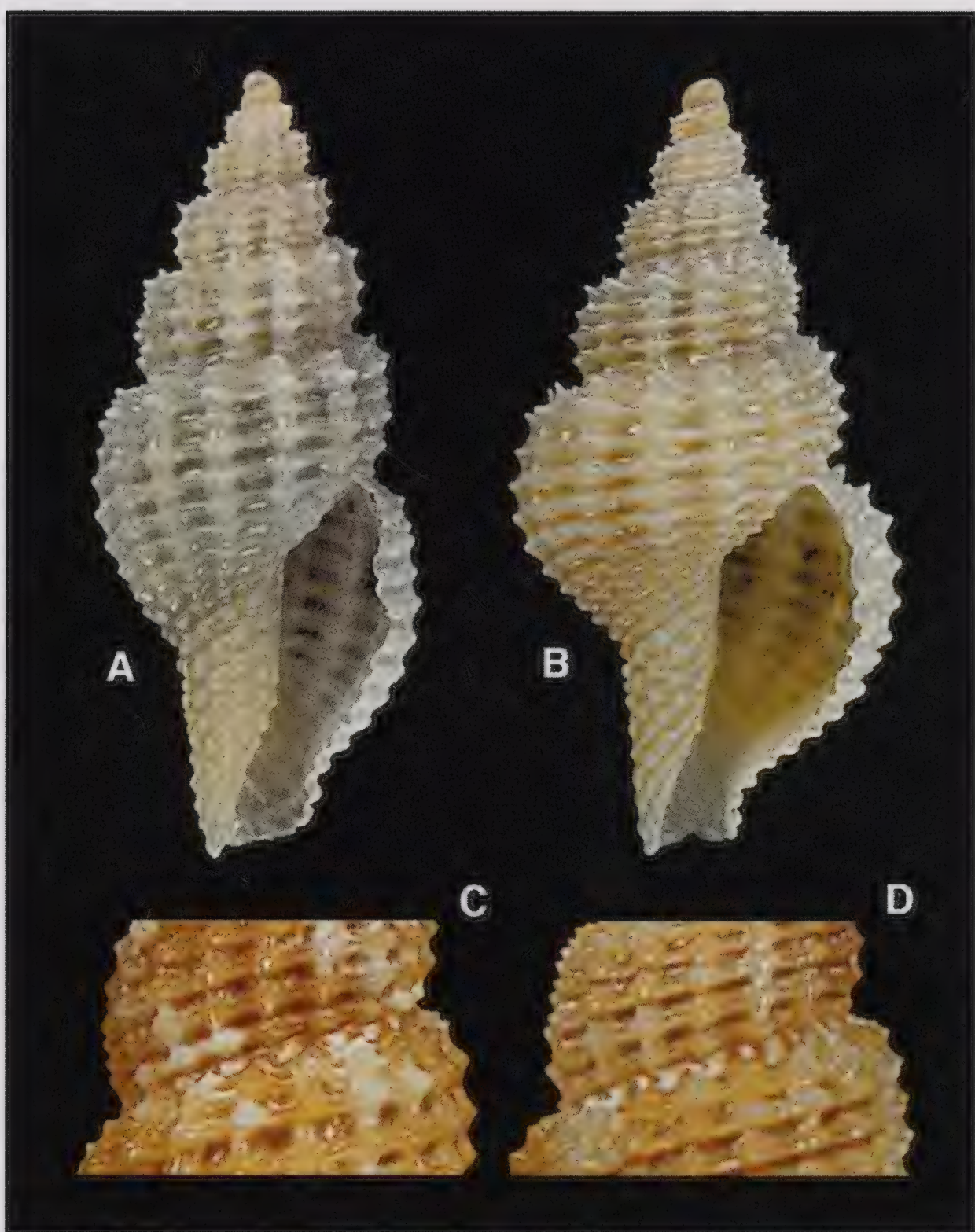
ture. No microgranules on the surface. **Axial sculpture** of 18-20 (19) slightly opisthocline ribs (sometimes very weak on the last whorl), and interspaces as wide as the ribs. **Spiral sculpture** on the last whorl of 18 cordlets of which 7-9 (8) cordlets above the aperture, with interspaces wider ( $\times 1.5$ ) than the cordlets. Cancellation rectangular, with small and elongated tubercles at the intersections. Tubercles on the first whorls narrow and spinulose narrow and spinulose. Sculpture visible in transparency throughout the internal shell wall.

**Subsutural ramp** very narrow.

**Columella** simple, slightly sinuous anteriorly, gently angled posteriorly.

**Outer lip** with 9-11 (11) strong inner denticles, the most anterior delimiting the siphonal canal, the most posterior delimiting the anal sinus. Siphonal canal short, widely open, slightly curved. Anal sinus evident, corresponding to two spiral cordlets.





**Fig. 61.** *Raphitoma* spp. **A.** *Raphitoma smriglioi* Pusateri & Giannuzzi-Savelli, 2013, Cyprus, off Larnaka, - 42 m, h: 6.5 mm; **B.** *Raphitoma spadiana* Pusateri & Giannuzzi-Savelli, 2012, same locality and deep, h: 7.0 mm; **C.** *Raphitoma smriglioi* Pusateri & Giannuzzi-Savelli, 2013, particular of subsutural zone; **D.** *Raphitoma spadiana* Pusateri & Giannuzzi-Savelli, 2012, particular of subsutural zone.

**Fig. 61.** *Raphitoma* spp. **A.** *Raphitoma smriglioi* Pusateri & Giannuzzi-Savelli, 2013, Cipro, al largo di Larnaka, - 42 m, h: 6,5 mm; **B.** *Raphitoma spadiana* Pusateri & Giannuzzi-Savelli, 2012, stessa località e profondità, h: 7,0 mm; **C.** *Raphitoma smriglioi* Pusateri & Giannuzzi-Savelli, 2013, particolare della zona sottosuturale; **D.** *Raphitoma spadiana* Pusateri & Giannuzzi-Savelli, 2012, particolare della zona sottosuturale.

**Siphonal fasciole** with 8-9 nodulose cords.

**Coloration** ranging from light to dark orange-tawny, with lighter cordlets and sometimes sparse white tubercles and a white sutural cordlet. Darker spiral interspaces visible in transparency from the inner side of the aperture, on a background bluish only in fresh specimens. On the last whorl, eighth abapical cordlet becoming lighter toward the peristome, with some white spots. The two axials closest to the peristome white on the central part.

**Soft parts** almost entirely yellow-orange upon collection, rapidly fading in few hours turning to white-yellowish with snow-white spots; dark grey or blackish speckles usually limited to the area around the base of tentacles sometimes extended also to the inner side face at the base of the siphon (J. Prkić pers. obs.).

## Remarks

It is possible that the dwarf forms attaining no more than 5 mm reported by Nordsieck (1977: 55) which we have never found, were in fact misidentified dwarf specimens of *Raphitoma contigua* (Monterosato, 1884), which we have observed (Pusateri et al., 2012).

*R. lineolata* has been frequently confused with *R. contigua*, from which it differs in the more slender outline

(H/W >2.45 vs 2.2), the less robust shell, the very narrow subsutural ramp, the narrower aperture, the generally darker colour, and a white subsutural cordlet.

This species differs from *R. corbis* due to the constant presence of brown lines between the spirals and to have thinner walls. It differs from *R. densa* due to the lack of the peculiar gray-ash maculae.

The original type series having gone lost, a neotype with multispiral protoconch, from St. Raphael (Var) has been selected by Pusateri et al., 2013: 16 in order to stabilise the use of this name.

## *R. smriglioi* Pusateri & Giannuzzi-Savelli, 2013 (Figs 60, 61A, 61C, 62B)

*Raphitoma smriglioi* Pusateri & Giannuzzi-Savelli, 2013: 16, figs 11-18, 21-22

*Raphitoma smriglioi* Manousis et al. 2017: 33, figs 2 a-b

## Type material

Holotype - Ognina (Catania) 15 m, height: 9.4 mm, width: 3.6 mm (MNHN-IM-2000-2571). Paratypes - A: Ognina 15 m, height: 9.4 mm, width: 3.9 mm (MNHN); B: Ognina 15 m, height: 5.9 mm, width: 2.7 mm, sub-adult, (MNHN); C: Brucoli (Siracusa) 20 m, height: 4.2 mm, width: 2.0 mm, (SMR); 20 m; D: Brucoli (Siracusa) 20 m, height: 8.7 mm, width: 3.3 mm (PUS).

## Type locality

Ognina (Siracusa), 36°58'N, 15°15'E.

## Other material examined

France – St. Raphael, 3 sh (MCZR-M-16696); La Ciotat, 1 sh (MCZR-M-16773).

Sicily – Brucoli (Siracusa), 3 sh (PUS); Gulf of Carini, 1 sh (PAL); Ognina (Siracusa), 12 sh (PUS); Cannizzaro (Catania), 1 sh (MIC), 1 sh (PAG);

Italy – Napoli, 1 sh (MCZR-M-16877); Capri Is., 1 sh (MCZR-M-16733), 1 sh (coll. Coen HUJ, *sub nomine* ms. “*Philbertia purpurea mitis* M (ms) typus, Capri!” handwritten by Coen); Porto Cesareo (Lecce), 1 sh (MIC); Marina di Ugento (Lecce), 7 sh (MAC); Torre del Serpe (Otranto), 1 sh (MAC); Scilla (Reggio Calabria), 1 sh (VAZ).

Croatia – Unprecised locality, 1 sh (DEL).

Greece – Limnos Is., 1 sh (SER).

Cyprus – off Larnaka, 42 m, 1 sh (BAR).

Turkey – Bozcaada Is., 1 sh (PUS); Adana, 1 sh (CGS).

## Distribution

known so far from the central and eastern Mediterranean Sea, where it is relatively uncommon.

## Description [in square brackets the data of the holotype]

**Shell of medium size for the genus (Figs 60-62)** height: 5.9-11.1 mm, mean: 8.1 mm, DS: 1.7 [9.4], width: 2.6- 4.2



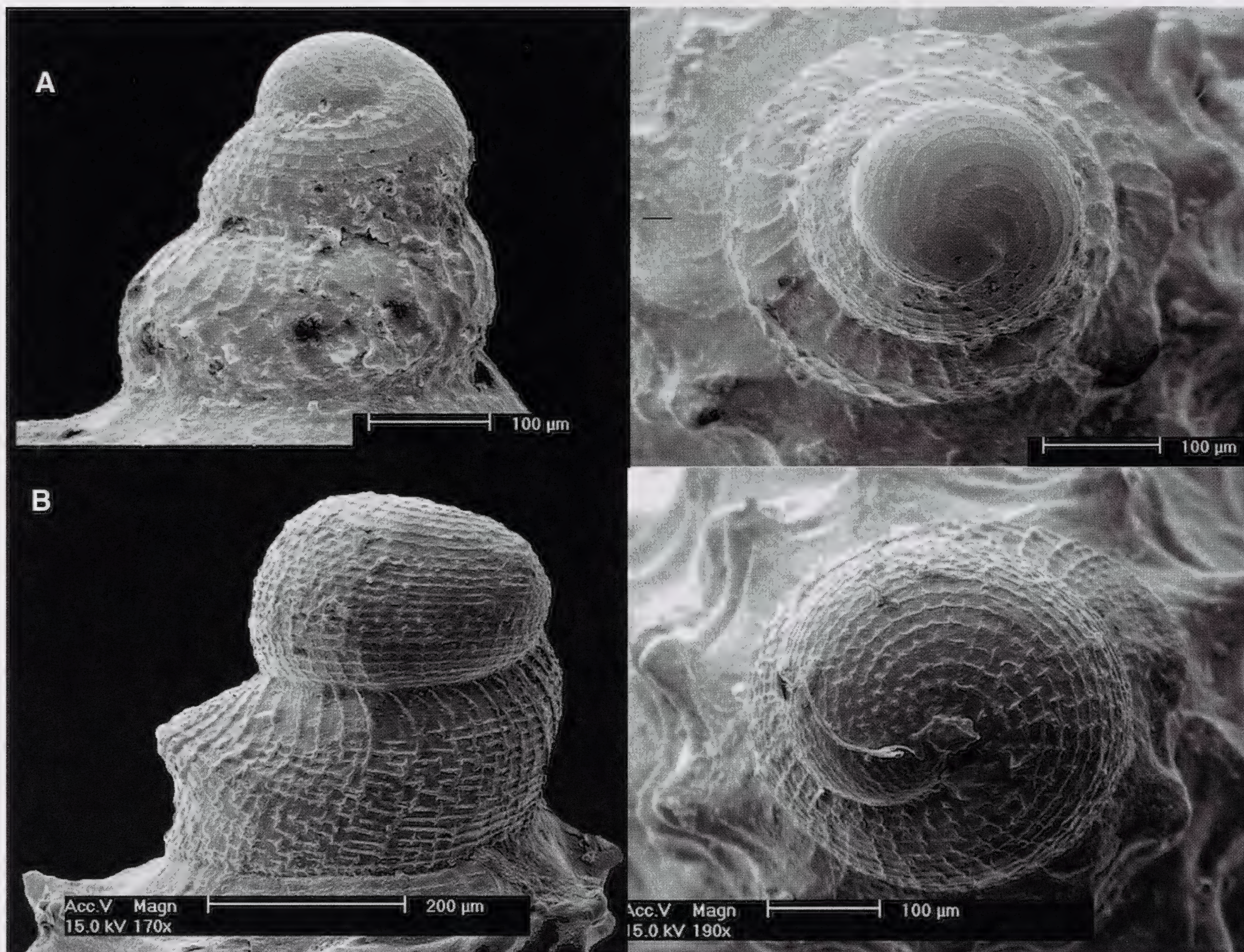


Fig. 62. A. *Raphitoma lineolata* (B.D.D., 1883), protoconch; B. *Raphitoma smriglioi* Pusateri & Giannuzzi-Savelli, 2013, protoconch.

Fig. 62. A. *Raphitoma lineolata* (B.D.D., 1883), protoconca; B. *Raphitoma smriglioi* Pusateri & Giannuzzi-Savelli, 2013, protoconca.

mm, mean: 3.2 mm, DS: 0.5 [3.5]. Thin, fusiform, slender, H/W: 2.26-2.64, mean: 2.49, DS: 0.12 [2.68].

**Protoconch paucispiral** (Fig. 62B), only protoconch I of 1.5 convex whorls, height: 405 µm, width: 368 µm; sculpture irregularly cancellate. **Protoconch-teleoconch boundary** well marked, slightly flexuose, opisthoclinal.

**Teleoconch** of 7 convex whorls. No microgranules on the surface. **Axial sculpture** of 16-18 (18) orthoclinal ribs, sometimes slightly opisthoclinal in the last whorl, interspaces slightly wider than the ribs. **Spiral sculpture** on the last whorl of 18 cordlets, of which 7 above the aperture, with interspaces wider ( $\times 1.8$ ) than the cordlets. Cancellation rectangular, with small and elongated tubercles at the intersections. Sculpture visible in transparency throughout the very thin internal shell wall.

**Subsutural ramp** very narrow, with small tubercles in correspondence with the tip of the axial ribs. Two cordlets on the subsutural ramp, the apical smaller with smaller tubercles, the second being the largest of the spirals. The third cordlet, as small as the first one.

**Columella** simple, slightly sinuous anteriorly, gently angled posteriorly.

**Outer lip** with 10-12 strong inner denticles, the most anterior delimiting the siphonal canal, the most posterior delimiting the anal sinus. Denticles 1-2 and 11-12

closer than the others. Anal sinus evident, corresponding to two spiral cordlets.

**Siphonal canal** short, open.

**Siphonal fasciole** with 9 nodulose cords.

**Coloration** from orange-tawny to very light tawny, with lighter cordlets and sparse white spots, and short white segments of the suprasutural cordlet.

**Soft part** pale yellowish, except for the head bearing a brownish-blackish area, just behind the eyes. Siphon pale yellowish, with many white speckles. Ventral part of the foot almost white and without spots, sides with numerous and dense white dots. (J. Prkić, pers. com.).

## Remarks

*R. smriglioi* differs from *R. lineolata*, in its paucispiral protoconch (*vs.* multispiral in *R. lineolata*).

*R. smriglioi* differs from *R. contigua* in its paucispiral protoconch, the more slender shell (H/W > 2.2, mean 2.63 *vs.* 2.2) and the very narrow subsutural ramp. *R. smriglioi* is also similar to *R. spadiana* (Fig. 55: the sister of *R. contigua*) in the general shell features but differs in the very narrow subsutural ramp and in its slightly smaller and more slender protoconch (405 µm x 400 µm





**Fig. 63.** *Raphitoma brunneofasciata* Pusateri & Giannuzzi-Savelli, 2013. **A.** lectotype, Ibiza (Balears) (SMF, h: 5 mm) [as *Raphitoma* (*Lineotoma*) *brevis* Nordsieck, 1977]; **B.** Jesolo (Venezia), h: 6.5 mm; **C.** Baie de Calvi (Corsica), h: 5 mm; **D.** Lo Scalone (Messina) h: 3.7; **E.** Scilla, h: 7.1 mm; **F.** *Raphitoma echinata* AA., Lo Scalone (Messina), h: 5 mm (Fig. **B.** photo courtesy Ennio Squizzato).

**Fig. 63.** *Raphitoma brunneofasciata* Pusateri & Giannuzzi-Savelli, 2013. **A.** lectotipo, Ibiza (Baleari) (SMF, h: 5 mm) [con il nome di *Raphitoma* (*Lineotoma*) *brevis* Nordsieck, 1977]; **B.** Jesolo (Venezia), h: 6.5 mm; **C.** Baia di Calvi (Corsica), h: 5 mm; **D.** Lo Scalone (Messina) **H.** 3.7; **E.** Scilla, h: 7.1 mm; **F.** *Raphitoma echinata* AA., Lo Scalone (Messina), h: 5 mm (Fig. **B.** Foto di Ennio Squizzato).



[H/W 1.06] vs. 425 µm x 450 µm in *R. spadiana* [H/W 0.94]).

While *R. lineolata* ranges throughout the entire Mediterranean Sea and extends into the neighbouring Atlantic, the known range of *R. smriglioi* includes only the central and eastern Mediterranean Sea, where it is also less common than *R. lineolata*.

### *R. brunneofasciata*

Pusateri & Giannuzzi-Savelli, 2013

(Figs 63, 65A)

*Raphitoma brunneofasciata* Pusateri & Giannuzzi-Savelli, 2013: 18

*Raphitoma (Lineotoma) brevis* Nordsieck, 1977: 59; pl. XX, fig. 156 (ex Requier, 1848, *nomen nudum*) non G. Seguenza, 1880

? *Pleurotoma lineare* [sic!] var. *brevis* Requier, 1848: 73

*Raphitoma linearis* var. *brevis* Requier, 1846 [sic!], Bogi et al., 1980: 14, fig. 4

*Lineotoma brevis* Nordsieck, 1982: 276; pl. 105, fig. 98.44

*Raphitoma brunneofasciata* Romani et al., 2017: 37 figs 8K-L

### Type material

*Raphitoma (Lineotoma) brevis* Nordsieck: lectotype (5 x 2.9 mm) and 15 paralectotypes (9 *R. linearis* and 6 *R. brevis*: SMF 340335/16) from Ibiza, with two labels reading “*Raphitoma brevis* (Requier 1943) [sic!]” and “*Cirillia brevis* Requier – Ibiza”; 1 paralectotype (lacking the protoconch: SMF 340332/1) from Monopoli (Italy), with two labels reading “*Raphitoma brevis* (Requier 1943) [sic!]” and “Mittelmeer (Italien: Apulien): Monopoli/Cirillia brevis Req./Monopoli”.

### Type locality

Ibiza Island (Balears).

### Material examined

The type material and:

France – Toulon, 1 sh (coll. Monterosato, MCZR-M-16475).

Corsica – Baie de Calvi, 2 sh (SMNH lot 73171D, legit A. Warén).

Spain – Malaga, 1 sh (AHU).

Croatia – Lastovo Is., 2 sh (BAR).

Sardinia – S. Teresa di Gallura 6 m (CRO).

Sicily – Cannizzaro (Catania), 1 sh (BAR); Capo Faro (Messina), 1 sh (BAR).

Italy – Secche delle Vedove, 130 m, 18 sh (PAO); Baratti Gulf (Livorno), 1 sh (PAO); Punta Scaletta, Giannutri Is. 60 m, 1 sh (BOG); Capraia Is., 1 sh (SMNH lot 73181); Torre Flavia (Ladispoli), 1 sh (coll. Pizzini, MCZR); Capri Is. 50 m, 1 sh (CAP); Costa Viola (Reggio Calabria), 3 sh (PUS); Scilla 52 m, 1 sh (PER), 3 sh (PUS); 8 sh (VAZ); 40 m, 1 sh (PAO), 2 sh (PAG); Crotone, 2 sh (PUS); Otranto, 1 sh (MAC); Giovinazzo, 5 sh (MEL); Jesolo (Venezia), 1 sh (SQU).

Greece – Paleokastritsa (Corfù), 2 sh (BAR).

### Description [in square brackets the data of the lectotype]

**Shell of medium size for the genus** height: 4-8 mm, mean: 5.8 DS: 1.57 [5], width: 3-4 mm, mean: 3.2, DS: 0.77 [2.9]. Fragile, biconic, H/W: 1.6-2.00, mean: 1.76, DS: 0.11 [1.72].

**Protoconch multispiral** (Fig. 65A) of 3.1 convex whorls, height: 567 µm, width: 527 µm, protoconch I of 1.25 whorls, width 232 µm, covered by large cancellations, protoconch II with a diagonally cancellate sculpture starting after a wide zone under the suture with fine slightly curved axial threads. Last whorl with short and strong keel before the onset of the protoconch. **Protoconch-teleoconch boundary** slightly flexuose, opisthocline.

**Teleoconch** of 3.5-4.5 (3.5) convex whorls, suture incise. No microgranules on the surface. **Axial sculpture** of 12-13 (12) elevate orthocline robust ribs, and interspaces wider (x1.5) than the ribs. **Spiral sculpture** of which 5 cordlets above the aperture, with interspaces twice as wide as the cordlets. Cancellation rectangular, with elongated (occasionally acute) tubercles at the intersections. Sculpture visible in transparency throughout the thin internal shell wall.

**Subsutural ramp** evident, with an additional abapical fine cordlet in very large shells.

**Columella** simple, slightly sinuous anteriorly. Siphonal canal short, open.

**Outer lip** sharp, crenulated, inner denticles undetected.

**Siphonal fasciole** with 7-8 nodulose cords.

**Coloration** uniformly straw yellow, the subsutural ramp darker, with comma-shaped white spots; darker band (as the subsutural ramp) as wide as 3-4 cordlets, on the middle of the spire, occasionally spotted by white right angle brackets. Protoconch sandy-yellow, usually lighter on first whorl.

**Soft parts** unknown.

### Distribution

Only known from examined material, probably ranging in the entire Mediterranean Sea.

### Remarks

*R. brunneofasciata* Pusateri & Giannuzzi-Savelli, 2013 is a replacement name for *Raphitoma (Lineotoma) brevis* Nordsieck, 1977, preoccupied by *Raphitoma brevis* (G. Seguenza, 1880: 104 pl. 11 fig. 11), a Tortonian fossil. Nordsieck (1977:59) described “*Raphitoma (Lineotoma) brevis* Requier, 1846”, evidently referring to “*Pleurotoma reticulatum* var. *brevis* Requier”. Actually, Requier’s work was published in 1848 and *Pleurotoma reticulatum* var. *brevis* is a *nomen nudum*. Nordsieck (1977) while making the name valid, described his material from Ibiza and the taxon must be ascribed to him, but is preoccupied by Seguenza’s binomen. The figure of Nordsieck (1977: pl. XX fig. 156) and the reported size (6 x 3.8 mm) do not match any of the existing syntypes.

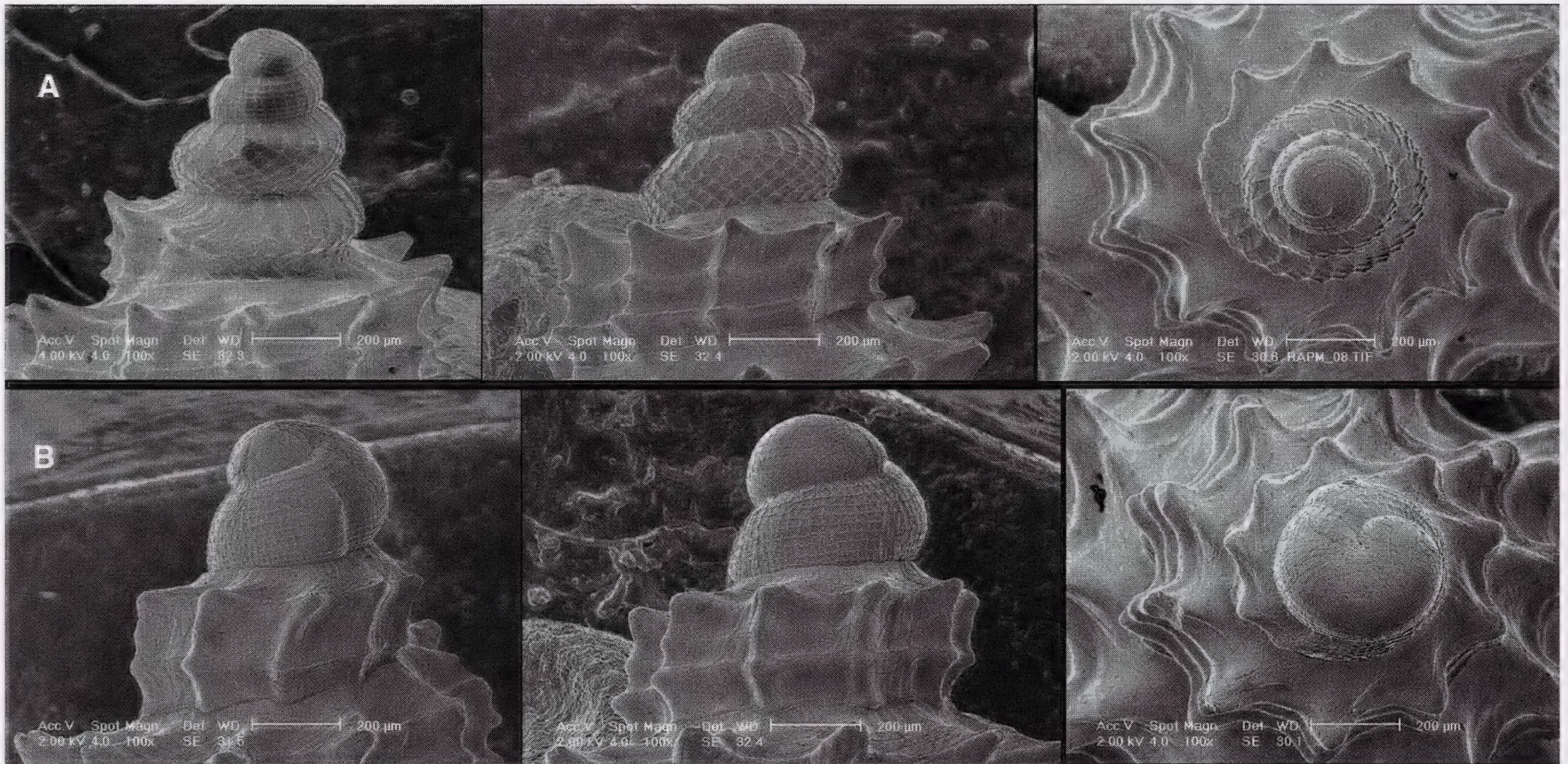




**Fig. 64.** *Raphitoma syrtensis* Nordsieck, 1977. **A.** holotype, Sfax (Tunisia) (SMF; h: 5.2 mm); **B.** Augusta (Siracusa), h: 8.5 mm; **C.** Kerkennah, h: 7.1; **D.** Calambrone (Pisa), h: 3.9 mm; **E.** *Raphitoma horrida* (Monterosato, 1884), Porto Cesareo (Lecce), h: 9.1 mm; **F.** *Raphitoma bracteata* (Pallary, 1904), Calvi (Corsica), h: 8.5 mm; **G.** *Raphitoma pallaryi* Nordsieck, 1977, Gabès (Tunisia), 8.6 mm

**Fig. 64.** *Raphitoma syrtensis* Nordsieck, 1977. **A.** olotipo, Sfax (Tunisia) (SMF; h: 5,2 mm); **B.** Augusta (Siracusa), h: 8,5 mm; **C.** Kerkennah, h: 7,1; **D.** Calambrone (Pisa), h: 3,9 mm; **E.** *Raphitoma horrida* (Monterosato, 1884), Porto Cesareo (Lecce), h: 9,1 mm; **F.** *Raphitoma bracteata* (Pallary, 1904), Calvi (Corsica), h: 8,5 mm; **G.** *Raphitoma pallaryi* Nordsieck, 1977, Gabès (Tunisia), h: 8,6 mm.





**Fig. 65. A.** *Raphitoma brunneofasciata* Pusateri & Giannuzzi-Savelli, 2013, protoconch; **B.** *Raphitoma syrtensis* Nordsieck, 1977, protoconch.

**Fig. 65. A.** *Raphitoma brunneofasciata* Pusateri & Giannuzzi-Savelli, 2013, protoconca; **B.** *Raphitoma syrtensis* Nordsieck, 1977, protoconca.

Nordsieck's description is a mix of two species (*R. linearis*: "often with some red lines"; and *R. brunneofasciata*: "brown band" and "protoconch similar to *linearis*, but with a beginning angle at the third whorls").

*R. brunneofasciata* is similar to the species in the *R. echinata*-complex (**Fig. 63F**), which also have a brown band on the middle of the last whorl. However *R. brunneofasciata* is diagnosed by its smaller size, the less slender outline, the outer lip characteristically lacking inner denticles, and the ligh 3-3.2 whorls protoconch (*vs.* the dark-brown 3.75-4 whorls protoconch of the species in the *R. echinata*-complex).

***R. syrtensis* Nordsieck, 1977**  
(**Figs 64, 65B**)

*Raphitoma (Lineotoma) brevis syrtensae* Nordsieck, 1977: 59; pl. XX, fig. 156 a

*Lineotoma brevis* (Requien, 1848) sensu Nordsieck & Talavera, 1979: 165; pl. 41 fig. 32 non Nordsieck, 1977

*Lineotoma brevis syrtense* Nordsieck, 1982: 277; pl. 105 fig. 98.45

**Type material**

*Raphitoma (Lineotoma) brevis syrtensae*: holotype, 5.2 x 3.3 mm (SMF) Sfax, with two labels reading "Raphitoma brevis syrtensis F. Nordsieck, 1977" and "holotypus Orig. 1977: pl. 20 fig. A156a/Mittelmeer (Tunesien):/Sfax".

**Type locality**

Sfax (Tunisia).

**Material examined**

The type material and:

Sardinia – Castelsardo Shoal (41.00 N, 8.72 E), 1 sh (BAR);

Sicily – Augusta (SR) 10 m, 1 sh (PUS); Brucoli (Siracusa), 1 sh (SMNH lot 73203A and 73204A).

Italy – Scilla 52 m, 2 sh (VAZ).

Tunisia – Kerkennah, 5 sh (PUS). Gabes, > 20 sh (SMNH lot 73175E).

**Description**

**Shell of small-medium size for the genus** (**Figs 1-5; 27A-E**) height: 4-10 mm, mean: 6.8 mm (DS: 2.49) [5.2], width: 2.8-5 mm, mean: 4 mm, DS: 1.31 [3.3]. Fragile, biconic, H/W: 1.45-1.9, mean: 1.71, DS: 0.17 [1.57].

**Protoconch paucispiral** (**Fig. 65B**), only protoconch I of 1.25 convex whorls, height: 356 µm, width: 435 µm. Sculpture irregularly cancellate. **Protoconch-teleoconch boundary** slightly indistinct but flexuose.

**Teleoconch** of 5-6 [6] convex whorls, suture incise. No microgranules on the surface. **Axial sculpture** of 12-13 [18] elevate, robust, orthocline ribs, interspaces wider (×1.5-2) than the ribs. **Spiral sculpture** with 4-5 [5] cordlets above the aperture, interspaces wider (×2) than the ribs. Cancellation rectangular, with acute, small and elongated tubercles at the intersections.

Sculpture visible in transparency throughout the very thin internal shell wall.

**Subsutural ramp** evident, with an additional abapical fine cordlet in very large shells.

**Columella** simple, slightly sinuous anteriorly.

**Outer lip** sharp, crenulated, undetected inner denticles **Siphonal canal** short, open.

**Siphonal fasciole** with 7-8 nodulose cords.

**Coloration** uniformly straw yellow, subsutural ramp occasionally darker, with comma-shaped white spots;



darker band (as the subsutural ramp) as wide as 3-4 cordlets, on the middle of the spire (rarely absent), occasionally spotted by white right angle brackets. Protoconch withish or ligh yellowish.

**Soft parts** unknown.

## Distribution

Only known from examined material, in the Central Mediterranean Sea.

## Remarks

Nordsieck used two different spelling: “*R* (L) *brevis syrtensae*” [sic!] (1977: 59) in the text, and “*Cirillia brevis syrtense*” in the caption to the figure (1977: 112, pl. XX). The first can simply be a case of misspelling, since afterwards he (Nordsieck, 1982: 277; pl. 105, fig. 98.45) he used also “*Lineotoma brevis syrtensei*”. However, as first revisors (ICZN, 1999: Art. 24.2.3) we explicitly select as original spelling *syrtense* (Syrte in Latin is “*Syrtis*, -is”), which is in turn accorded in gender to *Raphitoma* (Art. 34.2) in *syrtensis*.

*Raphitoma syrtensis* is nearly indistinguishable from *R. brunneofasciata* except for its paucispiral (*vs.* multispiral) protoconch. *R. horrida* (Monterosato, 1884) is diagnosed (even in juveniles) by having a wider cancellation, a typical scalariform outline and the inner denticles on the outer lip (see **Fig. 64D**). *R. pallaryi* Nordsieck, 1977 (*nomen novum* pro *Raphitoma mirabilis* Pallary, 1904 [*Homotoma*] non *R. mirabilis* Locard, 1891 [*Clathurella*]) (see **Fig. 64F**) and *R. bracteata* (Pallary, 1904) are also similar to *R. syrtensis* but can be distinguished by the more slender outline and inner denticles on the outer lip (see **Fig. 64E**). Curiously, Nordsieck & Talavera (1979) while dealing with “*Lineotoma brevis* Nordsieck, 1977” referred a protoconch of two whorls, but this was certainly an inadvertent mistake since Nordsieck (1977) already had separated his *R. brevis* (protoconch of 3 whorls) from *R. syrtensis* (protoconch of two whorls).

## Discussion

The genus *Raphitoma* as currently conceived includes – based on our published and unpublished data – c. 55 species in the NE Atlantic and Mediterranean Sea. Of them, c. 30 are known exclusively from the Mediterranean, of which 25% have non-planktotrophic development, while the c. 10 exclusively (or nearly exclusively) Atlantic species have planktotrophic development.

We have examined in this revision 10 pairs of sister cryptic species (*i. e.* c. 40% of the total diversity in the NE Atlantic) where the main (or only) difference between the members of each pair was in the protoconch morphology, reflecting different larval development (Jablonski & Lutz, 1980): multispiral protoconch associated with planktotrophic development *vs.* paucispiral protoconch associated with lecithotrophic development. In a recently published, somehow confused review, Manousis et al. (2017) at first suggested that such devel-

opmental differences were cases of poecilogony, postulating a genetic mechanism (without any experimental support, though) but eventually retained the species distinction. We have adopted herein the most commonly accepted framework for prosobranchs (Bouchet, 1989; Oliverio, 1997) that the dichotomy in development (planktotrophy *vs.* lecithotrophy) underlies a speciation event associated to the loss of planktotrophy (Oliverio, 1996).

Of the ten studied pairs, one includes species with almost allochronic distributions: *R. histrix* (planktotrophic) ranges from Miocene to Pleistocene of European seas, whereas its sister, *R. pseudohystrix* (lecithotrophic) ranges from Pleistocene to Recent of the Mediterranean Sea, with a short overlap during the Pleistocene. One pair includes species with allopatric ranges: *R. oblonga* (planktotrophic) is only known from the NE Atlantic, where it is rather common, whereas its sister *R. alleryana* (lecithotrophic), is extremely rare and endemic to the Central Mediterranean Sea. The remaining 8 studied pairs include exclusively Mediterranean species.

We may suppose that the speciation events subtending the pairs of species with extremely similar teleoconchs, have been relatively recent. This is also supported by the stratigraphic distribution of the *R. hystrix*-*R. pseudohystrix* pair, which suggests a speciation event in the Early Pleistocene. As suggested by Oliverio, 1996, environmental drivers of the loss of planktotrophy may have been related to the paleoclimatic and paleoceanographic fluctuations during the Pleistocene, with severe effects especially in the Mediterranean Sea.

Due to the higher connectivity among populations, the planktotrophic member in each pair is usually more common than the lecithotrophic one; with two exceptions: *R. philberti* and *R. papillosa* (lecithotrophic) are rather common, whereas their sisters *R. locardi* and *R. ebreorum* are very rare. One of the possible hypotheses to test is that loss of planktotrophy (and speciation) in these pairs is a relatively old event, with *R. locardi* and *R. ebreorum* currently on the way of extinction.

The presence of such a large number of recent events of developmental shifts in this group, is fully congruent with the high plasticity of raphitomids. The Indo-Pacific raphitomid genera *Kermia* Oliver, 1915 and *Pseudodaphnella* Boettger, 1895 show similar dynamics in the development evolution, with sister species discovered in *Pseudodaphnella* (Fedosov & Puillandre, 2015).

## Acknowledgements

We thank all the friends mentioned above with their acronyms, who have made the material of their collections available to us for study. The following colleagues are hartily thanked for their help with museum samples under their care:

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Species	SZ	H/W	OU	AS	PR	PH	PL	PW	TU	MG	SS	AR	AX	CP	DE	SF
<i>hystrix</i>	M	2.80-3.00	LF	FR	M	691	498	3.2	SP	N	L	22-24	O-OP	6	8-9	7-8
<i>pseudohystrix</i>	M	2.22-3.08	LF	FR	P	600	574	1.9	SP	N	L	12-29	O-OP	9	12-20	7-9
<i>oblonga</i>	M	2.24-3.15	SF	SO	M	480	370	2.6	S	N	N	16-31	O	4-9	10-13	7-8
<i>alleryana</i>	S	2.00-2.47	SF	SO	P	--	--	--	S	M	N	21-24	O	7-8	11-13	9-11
<i>bicolor</i>	M	2.15-2.66	OP	RO	M	375	374	2.7	E	N	N	16-22	O	6	8-11	7-8
<i>farolita</i>	M	2.15-2.24	OP	RO	P	360	416	1.5	E	N	N	13-18	O-OP	6-7	8-11	7-8
<i>skylla</i>	M	2.00-2.36	SP	RO	M	489	428	2.7	E	N	N	13-16	O	5-6	8-9	7-8
<i>kharybdis</i>	M	1.91-2.32	SP	RO	P	440	390	1.4	E	N	N	14-15	O-OP	5-6	8-9	8
<i>laviae</i>	S	2.15-2.57	SF	RO	M	550	395	2.75	P	N	N	16-23	O-P	6-7	8-10	5-6
<i>bartolinorum</i>	S	2.07-2.75	SF	RO	P	437	478	1.4	P	N	N	16-18	O-P	5-7	9-10	6-7
<i>locardi*</i>	M	2.22-2.64	SF	RO	M	400	440	3	E	N	N	15-21	O	6-7	10-11	8-9
<i>philberti</i>	M	2.21-2.81	SF	RO	P	367	386	1.3	E	N	N	15-20	O	6-8	9-11	8-9
<i>ebreorum</i>	M	2.19-2.63	SF	TH	M	408	379	2.8	S	Y	N	19-29	OP	7-10	10-13	8-9
<i>papillosa</i>	M	2.10-2.70	SF	TH	P	448	388	1.4	S	Y	N	14-32	OP	6-8	9-15	8-10
<i>contigua</i>	M	2.12-2.48	SF	SO	M	323	348	2.7	E	N	N	16-18	O-OP	6-7	8-9	9-10
<i>spadiana</i>	M	2.12-2.54	SF	SO	P	416	502	1.4	E	N	N	16-18	O-OP	7-8	11-12	8-9
<i>lineolata</i>	M	2.45-2.84	LF	TH	M	299	382	2.9	E	N	N	18-20	OP	7-9	9-11	8-9
<i>smriglioii</i>	M	2.26-2.64	LF	TH	P	406	368	1.6	E	N	N	16-18	O-OP	7	10-12	9
<i>brunneofasciata</i>	M	1.60-2.00	BI	FR	M	367	525	3.1	E	N	L	12-13	O	5	?	7-8
<i>syrtsensis</i>	M	1.45-1.90	BI	FR	P	356	435	1.3	E	N	L	12-13	O	4-5	?	7-8

**Table 3.** Summary of morphometrics and morphological features in the species of *Raphitoma* dealt with herein. AR: number of axial ribs (range); AS: aspect, (RO: robust, SO: solid, TH: thin, FR: fragile); AX: inclination of axials, (P: prosocline, OR: orthocline, OP: opisthocline); CP: number of cordlets on penultimate whorl, (mean); DE: number of denticles; H/W: heigth/width ratio (range); MG: microgranulation on the whole surface, (Y: yes, N: no); OU: outline, (OP: ovato-pupoid, SP: sub-pupoid, SF: sub-fusiform, LF: slender fusiform, BI: biconic); PH: protoconch height,  $\mu\text{m}$  (mean); PL: protoconch width:  $\mu\text{m}$  (mean); PR: protoconch, (M: multispiral, P: paucispiral); PW: number of protoconch whorls: (mean); SF: siphonal fasciole (number of cordlets); SS: subsutural zone, (W: weak, N: narrow, L: large); SZ: size, (S: small, m: medium, L: large); TU: tubercles, (S: small, L: large, E: elongated, SP: spinulose, P: pearl shaped).

\* protoconch data according Manousis et al., 2017.

**Tab. 3.** Morfometria e caratteristiche morfologiche delle specie di *Raphitoma* trattate. AR: numero delle coste (min.-max.); AS: aspetto, (RO: robusto, SO: solido, TH: sottile, FR: fragile); AX: inclinazione delle coste (P: prosocline, OR: ortocline, OP: opistocline); CP: numero dei cordoncini sul penultimo giro, (media); DE: numero dei denti; H/W: rapporto altezza/larghezza (min.-max.); MG: microgranuli sull’intera superficie (Y: si, N: no); OU: profilo (OP: ovato-pupoide, SP: sub-pupoide, SF: sub-fusiforme, LF: snello, BI: biconico); PH: altezza protoconca,  $\mu\text{m}$  (media); PL: larghezza protoconca,  $\mu\text{m}$  (media); PR: protoconca, (M: multispirale, P: paucispirale); PW: numero giri di protoconca (media); SF: fasciolo sifonale (numero di cordoncini); SS: zona subsuturale, (W: debole, N: stretta, L: larga); SZ: dimensioni, (S: piccole, M: medie, L: grandi); TU: tubercoli, (S: piccoli, L: larghi, E: elongati, SP: spinosi, P: a perline).

\* dati della protoconca secondo Manousis et al., 2017.

<i>hystrix</i>	12
<i>pseudohystrix</i>	22
<i>oblonga</i>	80
<i>alleryana</i>	6
<i>bicolor</i>	30
<i>farolita</i>	10
<i>skylla</i>	30
<i>kharybdis</i>	15
<i>laviae</i>	43
<i>bartolinorum</i>	34
<i>locardi</i>	18
<i>philberti</i>	54
<i>ebreorum</i>	17
<i>papillosa</i>	32
<i>contigua</i>	25
<i>spadiana</i>	23
<i>lineolata</i>	35
<i>smriglioii</i>	28
<i>brunneofasciata</i>	42
<i>syrtsensis</i>	10

**Table 4.** Number of specimens (only adults) whose conchiliar parameters were measured.

**Tab. 4.** Numero di esemplari (solo adulti) di cui sono stati misurati i parametri conchiliari.

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APPENDIX

Original descriptions of the nominal taxa studied in this revision.

*Raphitoma histrix* Bellardi, 1847

Bellardi 1847: 85 tav. IV fig. 14 on the basis of material received by Jan introduces *Pleurotoma histrix* with the following original diagnosis:

*Raphitoma histrix* Jan (Pleurotoma)

*Testa subfusiformi, elongata, angusta, costis longitudinalibus, et transversalibus exilissimis, lamellosis clathrata, in earum intersecatione papillis acutis, erectis hirsuta: anfractibus planiusculis, elongatis, postice laevibus: spira elata: apertura ovato-elongata: labro intus sulcato: canali longiusculo.* 1832 Pl. histrix Jan Cat. p. 10. n. 59. - 1845 Jan in litt. et specim.

Conchiglia quasi fusiforme, allungata, la cui superficie è reticolata da numerose coste longitudinali e trasversali, equidistanti, lamellose, all’ incontro delle quali si innalza una papilla acuta, spinosa: gli anfratti sono leggermente piani, allungati: l’ultimo è eguale a più d’un terzo della lunghezza totale, terminato in un canale allungato, dilatato: l’apertura è ovato-schiacciata: il labbro solcato internamente.

E facile il distinguere questa specie dalla *Raph. reticulata*, cui più d’ogni altra è affine, ove si ponga mente, che nella *Raph. histrix* la forma generale è molto più allungata, l’angolo spirale molto meno aperto, il canale più allungato, la reticolazione fatta da minor numero di coste; che queste ultime sono lamellose invece di essere rotondate; e che in fine al loro incontro si innalza un’elegante spina acuta.

Fossile dell’Astigiana.

*Raphitoma pseudohystrix* (Sykes, 1906)

original diagnosis:

*Clathurella pseudohystrix* n.n.

[omissis]

As the Marquis de Monterosato, who kindly suggested the above name [pseudohystrix] to me, points out, the fossil form [histrix] has a pointed protoconch, composed of three or four whorls; while the recent shell [pseudohystrix] in the characters of its protoconch, rather resembles Trophon. Precisely, where the fossil form disappeared and was replaced by the present shell, I am unable to determine but the two appear to be distinct.

*Raphitoma oblonga* (Jeffreys, 1867)

original diagnosis:

*Defrancia purpurea* var. 2. *oblonga*

Body light grey, mottled with purple: *pallial tube* long, purplish-brown, finely wrinkled; *tentacles* rather short, cylindrical, light grey; lower portion speckled with

white; *eyes* on long stalks amalgamated with the tentacles, about halfway up the latter; *foot* narrow; front indented in the middle, with angular corners; hinder part finely pointed; sole white. Shell of the same size as the other variety [philberti], but having the spire much shorter and not turreted; the body-whorl is proportionally much larger; sculpture finer, and not so tubercular.

*Raphitoma alleryana* (Sullioti, 1889)

original diagnosis:

*Philbertia Alleryana* Sullioti.

*P. testa tenui, fusiformi, minute reticulato-perlata, flava vel cornea, anfractu ultimo fascia una alba submediana parum conspicua signato, apici corneo, laevigato, lucido; anfractibus 6 ½ convexiusculis, celeriter crescentibus, sutura impressa, apertura subovata, labro externo simplici, inconspicue denticulato, cauda brevi, laevissime inflexa, columella vix incurvata. Alt. mill. 10 circa. Habitat cum precedente.* [spiaggia di S. Raniero (sic!) presso Messina].

Elegantissima forma ben distinta dalle sue congeneri pel suo aspetto slanciato prodotto dal rapido svolgimento dei giri, per la sottile reticolazione in cui la poca elevazione delle costule le dà, osservandola ad occhio nudo, un’apparenza perlata, per l’impressione della sutura, per la denticulazione poco valida del labbro esterno, per la brevità e poca inflessione della coda e finalmente per la tenuità della conchiglia e pel suo colore.

Ho imposto a questa specie il nome del mio onorevole amico e maestro March. T. Allery Di Monterosato il quale mi fu sempre largo di consigli e di materiale scientifico.

Ne ho rinvenuto parecchi esemplari nella spiaggia già citata di San Raniero ed a Porto Maurizio (Liguria Occidentale) alla spiaggia del Gazometro. In quest’ultima località però in minor numero che nella prima.

*Raphitoma bicolor* (Risso, 1826)

original diagnosis:

P. BICOLOR (N.), P. bicolore.

*P. Testa anfractibus octo, costis transversis crassis, valde approximatis, tuberculatis, tubercolis nodosis, obtusis, interstitiis lineis elevatis inter tubercolos sculptis; sutura angusta, profunda; epidermide fusco-purpurea, fasciis albis irregulariter dispositis notata.*

Coq. à huit tours de spire, sculptées de côtes épaisses, transverses, tuberculées fort rapprochées, les tubercules sont noduleux, obtus, et les interstices entre les tubercules sont ornés de petites lignes élevées, suture étroite, profonde; sa couleur est brun pourpre, marqués de bandes blanches disposées irrégulièrement.

Long. 0,012. Séj. Régions des algues. App. Toute l’année.

*Raphitoma farolita* Nordsieck, 1977

original diagnosis:

R (Ph) servaini *farolita* n. ssp.

Similar [to *servaini*], but whorls more rounded. Color light-dun to yellow, white ribpairs and dors. Proto-



conch only 1 ½ nipple shaped whorls, nucleus involved. 5 tele-whorls stout, with deep, oblique suture. 15 ribs, nearly = intervals. 15 (6 upper) spirals. Crossing points forming broad papillae. B. wh 3/5, mouth ½. Tail and mouth-part similar to the type [*servaini*]. (Fig. holotype from Ibiza, several paratypes from Ibiza and Brindisi).

*Raphitoma laviae* (Philippi, 1844)

original diagnosis:

*Pleurotoma La Viae* n. sp.

*Pl. testa oblongo-fusiformi, costellis longitudinalibus confertis circa 20, lineisque elevatis transversis (circa 5 in anfr. superioribus) clathrata; apertura oblonga, spiram subaequante; labro incrassato, intus crenato.*

*Specimen unicum inter Pleurot. grani copiam inveni.*

*Testa fere 3''' alta, 1 1/3''' lata, oblongo-fusiformis, rufo-fusca, anfractibus sex constans, priori similis sed primo adspectu numero costarum et linearum transversarum clathros longe graciliores formantibus oculos percutit. – Dixi in memoriam Cl. abatis B. la Via.*

[Species dedicated to Gregorio Barnaba La Via (1793-1854), prior of the Benedictine monks, sicilian naturalist]

The reference to *P. granum* allows us to identify the locations for Philippi's referral on page 199 of the vol. 1 under *P. rude*: "Cataniae, Panormi"

*Raphitoma locardi* Pusateri & Giannuzzi Savelli, 2013  
*nomen novum pro Clathurella cylindrica* Locard & Caziot, 1899 non Pease, 1860

original diagnosis:

*Clathurella cylindrica* de Monterosato

Coquille de taille moyenne, d'un galbe étroitement pupoïde-cylindrique très allongé; 6 à 7 tours assez convexes mais bien étagés, séparés par une suture très accusée, le dernier plus grand que la demi-hauteur, faiblement ventru dans le milieu, brusquement a[t] tenué dans le bas, et terminé par un canal ouvert, court et droit; test orné de réticulations à mailles subrectangulaires, un peu plus larges que hautes, formées par des côtes longitudinales étroites recoupées par des cordons décurrents un peu moins épais, passant par-dessus les côtes et formant à leur rencontre de petits mamelons arrondis; ouverture étroitement ovalaire, plus petite que la demi-hauteur totale; labre épais et fortement denticulé en dedans; coloration d'un brun roux vineux, parfois avec des taches blanches irrégulières. H: 10 à 14; D: 4 ½ à 5 ½ millimètres.

Habitat – R. Ajaccio; zones littorale et herbacée. In nota Locard & Caziot precisano "Nous possédons également cette espèce d'un grand nombre de station des côtes méditerranéennes de France".

*Raphitoma philberti* (Michaud, 1829)

original diagnosis:

*Pleurotoma Philberti* Nob.

*P. Testa parva, turrita, colore varia, saepius nigra, albo varie-*

*gata, longitudinaliter costata; striis transversis aequalibus et aequidistantibus arata; anfractibus sex cancellatis, convexis; sutura profunda; apice obtuso; apertura nitida; labro intus plicato, canali recto, brevi.*

Hauteur, 4 à 5 lignes..... 6 lignes pour la variété.

Diamètre, 2 lignes... 2 à 2 ½ lignes, id.

Petite coquille à côtes rapprochées, très variée dans sa couleur, qui est tantôt entièrement noir tachée de blanc, tantôt jaunâtre ou grise; les côtes longitudinales et les stries spirales, plus exprimées dans les interstices, formant un treillis.

Cette espèce, quoique voisine, diffère du *Pleurotoma Cordieri*, PAYRAUD. Catal. descript. et méthod. des Anél. et des Mollusq. de l'île de Corse, p. 144, pl. 7, fig. XI. ile treillis de notre espèce est moins lamelleux: elle est constamment beaucoup plus petite; sa suture est moins profonde, et l'aspect en général en est tout différent; le sommet est obtus, l'ouverture luisante et le bord droit plissé intérieurement.

Il existe une variété plus allongée, dont le sommet est aigu. HAB. La Méditerranée. Agde, Cette (Hérault), Collioure et Portvendre, (Pyrenées Orientales), où elle n'est pas rare. Dédiée à notre jeune ami Philbert, naturaliste à Montpellier. C'est lui qui, le première nous a fait séparer cette espèce de celles déjà connues.

*Raphitoma papillosa* (Pallary, 1904)

original diagnosis:

*PHILBERTIA PAPILLOSA* Pallary, nov. sp.

*Testa producta, fusiformis, turrita; spira elata acuminata. Anfractus 7; apicales 2; normales 5; convexi, numerosi, angusti, elati, costis longitudinalibus ac funiculis decurrentibus lamellosis cancellati, sutura profunda juncti; anf. ult. spirae longitudinem superans. Apertura subovata. Columella recta. Cauda sat longa, aperta. Labrum rotundatum, intus incrassatum dentatumque; sinus suturalis angustus, valde conspicuus. Color flavidus, maculis albidis distinctus.*

Alt. 15 mm, lat. 5 ½.

Coquille allongé, fusiforme, à section profonde; spire élevée; 7 tours: dont 2 apicaux lisses et 5 normaux convexes, cancellés par de nombreuses côtes longitudinales et des funicules décurrents lamelleux. Hauteur du dernier tour supérieure à la longueur de la spire. Ouverture subovale; columelle droite. Canal assez long, ouvert; labre arrondi épaissi et denticulé à l'intérieur, sinus sutural étroit mais bien marqué. Couleur d'un jaune sale clair, avec des taches blanchâtres.

Sfax

*Raphitoma lineolata* (B.D.D., 1883)

original diagnosis:

*Clathurella purpurea* var. ex col. 5, *lineolata* B.D.D.

"Jolie variété d'une teinte rosée ornée d'une linéole brune entre chaque cordon décurrent; ces linéoles sont très apparentes sur la face interne du labre"

*Raphitoma brunneofasciata* Pusateri & Giannuzzi-Savelli, 2013



*nomen novum* pro *R. brevis* Nordsieck, 1977 non G. Seguenza, 1880

original diagnosis:

R (L) *brevis* (REQUIEN, 1846) (*Pleurotoma*). 6/3,8 mm. Lus., occid. Medit. Very ventricose fusoid. Snow white, with a brown band at the base-contraction and within the palatal. Often with some red lines. Protoconch similar to *linearis* (A 153), but with a beginning angle at the 3rd whorl. Telewhorls conspicuously vertically shouldered. 12 high ribs, only ½ of the intervals. 11-12 spirals (3 upper), crossing points nodulus [sic!] pointed. B.

Wh. ¾ mouth 3/5, wide-opened. No varix, no lip teeth. Tail well developed, long. Canal short. (Fig. orig. from Ibiza).

*Raphitoma syrtensis* Nordsieck, 1977 (nom. em.)

original diagnosis:

R (L) *brevis syrtensae* n. ssp. Somewhat smaller, snow-white, without any band. Protoconch: 2 smooth, inflated whorls, the second with beading [sic!] of a keel. A parallel form as **nivea** to **echinata** etc. (Fig. of the protoconch only, Sfax).















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*Esempio di gerarchia sistematica e sinonimia:*  
Family Cardiidae Lamarck, 1809  
Subfamily Cardiinae Lamarck, 1809  
Genus *Acanthocardia* Gray, 1853  
(type species *Cardium aculeatum* Linné, 1758)

*Cardium indicum* Lamarck, 1819  
(Fig. 1A–D, Fig. 2C)

*Cardium hians* Brocchi, 1814: p. 508, tav. 13, fig. 6 (non Spengler, 1799).  
*Cardium indicum* Lamarck, 1819: p. 4.  
*Cardium (Cardium) indicum* Lamarck – Fischer-Piette, 1977: p. 112, tav. 10, fig. 4 (tipo).

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*Esempi di bibliografia:*

SALAS C., 1996. Marine Bivalves from off the Southern Iberian Peninsula collected by the Balgim and Fauna 1 expeditions. *Haliotis*, **25**: 33-100.  
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CARTER J.G., CAMPBELL D.C. & CAMPBELL M.R. 2000. Cladistic perspectives on early bivalve evolution, in Harper E.M., Taylor J.D. & Crame J.A. (eds), The Evolutionary Biology of the Bivalvia. *Geological Society, London, Special Publications*, **177**: 47-95.  
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